

THE DEVELOPMENT OF ORGANIC LIGHT AVIATION IN THE
ARMY GROUND FORCES IN WORLD WAR II

A thesis presented to the Faculty of the U.S. Army
Command and General Staff College in partial
fulfillment of the requirements for the
degree

MASTER OF MILITARY ART AND SCIENCE
General Studies

by

ROBERT S. BROWN, MAJ, USA
B.A., University of South Carolina, Columbia, South Carolina, 1986

Fort Leavenworth, Kansas
2000

Approved for public release; distribution is unlimited.

DTIC QUALITY INSPECTED 4

20001120 121

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
<small>Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.</small>				
1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE 2 Jun 00	3. REPORT TYPE AND DATES COVERED Master's Thesis 6 Aug 99 - 2 Jun 00		
4. TITLE AND SUBTITLE The Development of Organic Light Aviation in the Army Ground Forces in World War II		5. FUNDING NUMBERS		
6. AUTHOR(S) MAJ Robert S. Brown, USA				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Army Command and General Staff College ATTN: ATZL-SWD-GD 1 Reynolds Ave. Ft. Leavenworth, KS 66027-1352		8. PERFORMING ORGANIZATION REPORT NUMBER		
9. SPONSORING/ MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSORING/MONITORING		
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.		12b. DISTRIBUTION CODE A		
13. ABSTRACT (Maximum 200 words) <p>This study addresses how the Army Ground Forces (AGF) developed and incorporated organic light aviation into the force structure during World War II. The work includes a brief background on the reasons the AGF developed this capability and how it employed this organic aviation in the field artillery. The study also addresses the parallel development and limited employment of Army Air Forces liaison squadrons designed to support the AGF.</p> <p>This thesis concludes that the AGF developed a responsive capability to support the aerial adjustment of artillery that quickly expanded to fill a multitude of tasks to support the ground commander. The thesis also concludes that the Army Air Forces did not develop a liaison organization capable of meeting the needs of the AGF. Understanding the problems that led to the development of organic light aviation will perhaps assist future Army leaders in developing and resourcing organizations, material, and force structure that is responsive to the maneuver commander.</p>				
14. SUBJECT TERMS Organic Aviation, puddle jumper conference fighting grasshoppers, liaison aviation, Army aviation, air observation posts			15. NUMBER OF PAGES 138	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED	18. SECURITY CLASSIFICATION UNCLASSIFIED	19. SECURITY CLASSIFICATION OF ABSTRACT UNCLASSIFIED	20. LIMITATION OF ABSTRACT UL	

THE DEVELOPMENT OF ORGANIC LIGHT AVIATION IN THE
ARMY GROUND FORCES IN WORLD WAR II

A thesis presented to the Faculty of the U.S. Army
Command and General Staff College in partial
fulfillment of the requirements for the
degree

MASTER OF MILITARY ART AND SCIENCE
General Studies

by

ROBERT S. BROWN, MAJ, USA
B.A., University of South Carolina, Columbia, South Carolina, 1986

Fort Leavenworth, Kansas
2000

Approved for public release; distribution is unlimited.


MASTER OF MILITARY ART AND SCIENCE

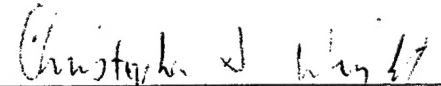
THESIS APPROVAL PAGE


Name of Candidate: Major Robert S. Brown

Thesis Title: The Development of Organic Light Aviation in the Army Ground Forces in World War II

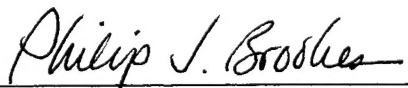
Approved by:

 , Thesis Committee Chairman
Colonel Lawyn C. Edwards, M.S., M.M.A.S.

 , Member
Major Christopher D. Wright, M.P.A.

 , Consulting Faculty Member
Lieutenant Colonel James C. McNaughton, Ph.D.

Accepted this 2d day of June 2000 by:

 , Director, Graduate Degree Programs
Philip J. Brookes, Ph.D.

The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

ABSTRACT

THE DEVELOPMENT OF ORGANIC LIGHT AVIATION IN THE ARMY GROUND FORCES IN WORLD WAR II, by MAJ Robert S. Brown, USA, 127 pages.

This study addresses how the Army Ground Forces (AGF) developed and incorporated organic light aviation into the force structure during World War II. The work includes a brief background on the reasons the AGF developed this capability and how it employed this organic aviation in the field artillery. The study also addresses the parallel development and limited employment of Army Air Forces liaison squadrons designed to support the AGF.

This thesis concludes that the AGF developed a responsive capability to support the aerial adjustment of artillery that quickly expanded to fill a multitude of tasks to support the ground commander. The thesis also concludes that the Army Air Forces did not develop a liaison organization capable of meeting the needs of the AGF. Understanding the problems that led to the development of organic light aviation will perhaps assist future Army leaders in developing and resourcing organizations, material, and force structure that is responsive to the maneuver commander.

ACKNOWLEDGMENTS

To my wife, Judi, and my daughter, Paige, I must express my gratitude and appreciation for your support throughout this past year. I would also like to thank the thesis committee who provided me valuable insight and guidance in drafting this research. Finally, I must recognize Mr. Alfred W. "Dutch" Shultz who assisted me by sharing his first-hand accounts as one of the most successful Army liaison pilots of World War II.

TABLE OF CONTENTS

	Page
THESIS APPROVAL PAGE	ii
ABSTRACT	iii
ACKNOWLEDGMENTS	iv
ABBREVIATIONS	vi
ILLUSTRATIONS	vii
CHAPTER	
1. INTRODUCTION	1
2. BACKGROUND	10
3. DEVELOPMENT	39
4. EMPLOYMENT	68
5. EXPANSION AND CONCLUSIONS	105
APPENDIXES	
1. BRIEF CHRONOLOGY OF KEY EVENTS.....	114
2. AIRCRAFT COMPARISON.....	116
3. WAR DEPARTMENT MEMORANDUM WDCG 320.....	117
BIBLIOGRAPHY	120
INITIAL DISTRIBUTION LIST	127

ABBREVIATIONS

AAC	Army Air Corps
AAF	Army Air Forces
AGF	Army Ground Forces
AGL	Above Ground Level
ACTS	Air Corps Tactical School
ASC	Air Support Command
BMNT	Beginning of Morning Nautical Twilight
CAA	Civil Aeronautics Authority
CAS	Close Air Support
CPTP	Civilian Pilot Training Program
DIVARTY	Division Artillery
EENT	End of Evening Nautical Twilight
ETO	European Theater of War
FAC	Forward Air Controller
FLOT	Forward Line of Troops
FM	Field Manual
GHQ	General Headquarters
IFR	Instrument Flight Rules
LST	Landing Ship Tank
OCS	Officer Candidate School
OP	Observation Post

PMP	Protective Mobilization Plan
PRU	Photoreconnaissance Unit
SRL	Short Range Liaison
STOL	Short Take Off and Landing
TO	Table of Organization
TTP	Tactics, Techniques, and Procedures
VHF	Very High Frequency

ILLUSTRATIONS

Figure	Page
1. O-46 Observation Airplane.....	18
2. USAAF Organizational Chart.....	22
3. Patch of the Field Artillery School, Department of Air Training	39
4. Infantry Division, Artillery Brigade TO 1942-1945	54
5. L-1A Vigilant.....	55
6. L-4A Cub	56
7. L-5B Sentinel	58
8. L-4 loaded in a 2 1/2 Ton short bed truck.....	60
9. Picture of converted LST flight deck.....	80
10. L-4 utilizing Brodie Device	99

CHAPTER 1

INTRODUCTION

Over Clouds, under wires, the hell with the landing gear and the tires. We're the eyes of the artillery. In and out through the trees we're as hard to find as fleas. We're the eyes of the artillery.¹

The Grasshopper Song

In the fall of 1942 three L-4 aircraft took off from the deck of the aircraft carrier USS *Ranger* forty miles from the North African coast to provide aerial observation for the adjustment of artillery and naval gunfire in support of Operation Torch.² This baptism by fire of organic light aviation was not without problems. Met with friendly fire on their ingress to the beach, only two of the aircraft were able to conduct follow-on operations after arriving on the coast. These problems were a reflection of the late introduction of the air sections and poor planning and coordination of the task force. Despite these initial shortcomings, the concept initiated in 1940 by proponents in the field artillery community was proven feasible. In subsequent operations, the aerial observation post (Air OP) enhanced operations by not only providing aerial adjustment of artillery fires, but expanding to perform other critical tasks for both the ground and artillery commanders.

The purpose of this thesis is to examine the development of organic light aviation and how it supported Army Ground Forces (AGF) despite the parallel development and employment of a like capability by the Army Air Forces (AAF). The primary question to be answered is, "Did organic light aviation develop to support AGF requirements?" The research includes the development, utilization, and missions designed to support the

AGF, as well as the AAF parallel development of liaison squadrons and their attempts to gain control over organic light aviation.

On 9 March 1942, the War Department established three separate commands within the United States Army: Army Ground Forces, Army Air Forces and Army Service Forces.³ This separation of the Army Air Forces from Army Ground Forces enabled the AAF to focus on the development of Air War Plan Division 1. This was the AAF blueprint for strategic bombing that supported the presidential decision to expand the AAF. The primary concept for development by the AAF was the employment of the bomber to conduct strategic attack against a nation's center of gravity. This concept was based on the Industrial Web Theory developed by the "Bomber Mafia" of the Air Corps Tactical School during the interwar period.⁴

This idea was originally conceived during World War I and expanded on during the interwar period by aviation theorists. One of these, Giulio Douhet, promoted the use of the bomber to attack a nation's center of gravity and avoid large ground conflicts in his book *The Command of the Air*.⁵ Being witness to the enormous human suffering during World War I, Douhet looked to the air to avoid a protracted ground warfare that lacked sufficient maneuver to arrive at the decisive point. Douhet reasoned that the same efforts could be achieved through air power and there was no longer a requirement for large armies.⁶ Proponents of this idea abounded in the United States Army Air Corps and worked hard at developing this concept during the post war period. Generals Mitchell, Arnold, and Spaatz were avid supporters of this theory and sought to galvanize this concept as the primary function of the Army Air Corps (AAC).

Two problems emerged as a result of this shift in focus by the AAF. The first was in command and control and the second was in aircraft procurement. Both of these problems would hamper air ground cooperation during the General Headquarters (GHQ) maneuvers. The first problem involved the command and control of aviation in support of the AGF. This led to a number of doctrinal changes and the formation of an additional command within each numbered air force. The problem with aviation procurement involved acquiring aircraft that would support the observation and reconnaissance requirements of the AGF.

An attempt to fix the deficiency in command and control, as a result of the reorganization of the AAF, was the formation of Air Support Commands (ASC). The War Department directed the formation of this organization in preparation for the GHQ maneuvers of 1941.⁷ On 25 July 1941, the Army Air Corps established an ASC in each numbered air force to coordinate aviation support with the ground forces. The ASC was a command and control headquarters that supported the ground force commander. The ASC was responsible for coordinating the employment of aviation assets that were made available for specific tactical operations. Pursuit, bomber, and attack squadrons would be added to the ASC based on the operational requirements of the ground force commander. The only organic aviation assigned to the ASC was the observation squadron later renamed liaison squadron. Prior to the formation of the ASC, the responsibility for aerial adjustment of artillery fires was passed to National Guard. These National Guard observation squadrons were tasked to conduct both reconnaissance, and aerial adjustment of artillery fires for the infantry division. This solution did not meet the expectations of the ground commanders during the GHQ maneuvers. The ASC was often under

equipped with the type of aircraft needed to support observation, and reconnaissance for the AGF. The problem in providing sufficient resources to the ASC to support the AGF needs was never sufficiently resolved during the war.

The second problem was in aircraft procurement and development. As the pace of aircraft technology rapidly advanced, manufacturers continued to design observation and reconnaissance aircraft that grew heavier, faster, and more complex over the span of development leading to World War II. These aircraft, intended to directly support AGF commanders, were no longer capable of operating from the austere environment associated with ground maneuver warfare. The AAF continued to develop and field observation aircraft within the existing doctrinal framework that developed after World War I. This limited the interoperability of the observation squadrons as the majority of these aircraft had to operate from fixed bases.

The ground forces requirements for aviation support were not based on specific types or numbers of aircraft. The only requirement was that sufficient resources be provided to conduct both observation and reconnaissance. The predominant fear in the AGF was that the AAF would continue to move farther away from the development and training of the tactical employment of aircraft to support ground maneuver. The AGF knew that the ultimate burden for defeating an enemy would be borne largely by ground forces. They also knew that two preeminent facts prevailed to ensure success. The first was that the mobility of the ground units necessary for a successful offensive could not be achieved without the use of aviation to extend the range of reconnaissance operations. The other was that without sufficient joint training, air ground cooperation would not be achieved on the battlefield and could not be conducted ad hoc.⁸ These positions

combined with the inadequate performance of the AAC in supplying sufficient aircraft to perform observation, demanded that the AGF develop an organic aviation capability to fulfill the observation requirements.

The field artillery had been developing concepts for the use of light airplanes to assist in the direction of fires as early as 1912. These tests proved the feasibility of using airplanes to both acquire targets and adjust fire for the artillery. World War I proved that this was a valid concept that should be incorporated in to the Army to enhance observation and assist in the adjustment of long-range indirect fires. Problems with command and control and coordination with the Air Service prevented the use of the airplane to achieve its maximum potential to conduct artillery observation during this conflict. The idea was not lost and throughout the interwar period a number of articles appeared in the *Field Artillery Journal* on this subject.

This professional dialogue continued to spark interest within both the artillery community and the ground forces in general. By the arrival of the GHQ maneuvers several experiments to utilize light airplanes by both the artillery and the armor community had been conducted. These experiments illustrated to the proponents of this idea that it was a valid concept worth pursuing for inclusion in the pending GHQ exercises.

The GHQ maneuvers conducted in 1941 were designed to exercise maneuver and command and control at the tactical level.⁹ The lessons learned and shortfalls identified would have a significant impact on shaping the Army force structure to meet the nation's expected entry into World War II. The exercises enabled the field artillery to experiment

with light aviation while gaining support for the program from the senior Army leaders that were directly involved in the maneuvers.

During the 1941 exercises, leading manufacturers provided general aviation aircraft for experimental use in support of ground forces. The results of these demonstrations continued to justify the earlier recommendations by the leadership of the field artillery to incorporate light airplanes. There were staunch supporters of this concept in the ranks of the field artillery as well as in the infantry and the cavalry. Their position was reinforced by the inadequate performance of the ASC developed to support AGF requirements for observation and reconnaissance throughout the exercises.¹⁰

As a result of the positive results of the incorporation of light airplanes in support of the ground forces, the War Department authorized operational tests. This testing was based on recommendations of senior military observers and field commanders that participated in the maneuvers. The United States entry into World War II would delay the operational tests until February 1942. The 2d Infantry Division and the 13th Field Artillery Brigade conducted the tests. The boards directed to observe the tests forwarded their reports to the War Department recommending the inclusion of organic light aviation in field artillery units. The tests also provided a starting point to build a basis of authorization for the new organization.¹¹

The sixth of June 1942 marked the beginning of organic aviation as part of the AGF to enhance the ground commander's capabilities in aerial observation that were not present in the AAF. The development of organic light aviation for the AGF was founded in the reorganization of the AAF and the change in operational focus to support air

operations as a separate and distinct form of warfare as opposed to complementing the ground force.¹²

The AAF devoted the vast majority of resources and funding prior to World War II into building a strategic bombing capability. The introduction of this bomber force came at the expense of developing doctrine and organizations to support the ground force. From the end of World War I and throughout the interwar period, the ground Army became reliant on aerial observation to perform reconnaissance and assist the artillery in identifying targets and adjusting fires. This void in observation and reconnaissance capability, created by the AAF pursuit of a bomber force, left the AGF to pursue development of an organic capability.¹³ This organic aviation would be responsive to the ground commander by operating with his assigned artillery. The air sections of the artillery battalions would be both mobile and flexible to support the commander. Unlike the AAF liaison squadrons, the artillery air sections would eat, sleep, and operate with their supported battalion in the close battle area.

Initially conceived to provide aerial adjustment of artillery, organic light aviation would expand to provide reconnaissance, radio relay, command and control support, and liaison support. These missions directly contributed in shaping the battlefield as a combat multiplier. By the end of World War II, they were being used in all theaters of operation and plans were made to expand air sections to armor, infantry, and cavalry organizations.¹⁴ These versatile air sections had become a valuable part of the AGF.

The majority of information published on this subject is in the form of after-action reports conducted at the cessation of hostilities and first hand accounts published by participants in both the AGF and the AAF. There are numerous references contained in

these reports to the problems encountered in training, procurement, employment, and the solutions developed to incorporate light aviation into the AGF. The references also address the controversy surrounding the light aviation between the AGF and the AAF. The controversy was based on the missions of light aviation, the expansion plan of the reorganized Army Air Forces and the War Department's challenge in resourcing two aviation force structures simultaneously.

Previous research has failed to describe the development of organic light aviation and the solutions developed with respect to doctrine, training, organization, and material that evolved to support the AGF. The research also illustrates the problems between the AGF and the AAF on the development and use of organic light aviation. By the end of the war, organic light aviation expanded well beyond the original scope called for by the field artillery. The research contained in this thesis complements previous research. This research used secondary source documents and some primary sources in the form of field manuals, books, after-action reports, unit histories, and first-hand accounts from personnel assigned to these organizations.

The development of light aviation for the AGF provides insight into the origins of Army Aviation and how it evolved to support the ground maneuver commander. The relevance for Army Aviation today is that many of the reasons that necessitated the creation of an organic air arm mirror critical issues that the Army faces today in developing doctrine, building force structure, and fielding material as the Army relies more on joint interoperability. The Army must continue to develop aviation capabilities that enable commanders to execute combat operations that are both responsive and complement the ground scheme of maneuver.

¹Alfred W. "Dutch" Shultz, interview by author, notes, St. Joseph, Missouri, 8 April 2000.

²William K. Kay, "The Army Aviation Story," *United States Army Aviation Digest*, June 1961, 2.

³James W. Bradin, *From Hot Air to Hellfire: The History of Army Attack Aviation* (Novato, CA: Presidio, 1994), 57.

⁴Phillip S. Meilinger, *The Paths of Heaven: The Evolution of Airpower Theory* (Maxwell, AFB, AL: Air University Press, 1997), 225.

⁵Giulio Douhet, *Command of the Air*. Trans. Dino Ferrari (New York: Coward-McCann, 1942), 83-84.

⁶*Ibid.*, 85

⁷Christopher R. Gabel, *The US Army GHQ Maneuvers of 1941* (Washington, DC: Center of Military History, 1992), 179.

⁸Kent R. Greenfield, *Army Ground Forces and the Air-Ground Battle Team including Organic Light Aviation*, Study No. 35 (Fort Monroe, VA: Historical Section-Army Ground Forces, 1948) 30.

⁹Gabel, *The US Army GHQ Maneuvers of 1941*, 44.

¹⁰Greenfield, *Army Ground Forces*, 23.

¹¹War Department Memorandum (2-5-42), 6 June 1942, subject: Organic Air Observation for Field Artillery [reproduced in Appendix C].

¹²Thomas H. Greer, *Development of Air Doctrine in the Army Air Arm 1917-1941* (Washington, DC: Government Printing Office, 1955; reprint, Washington, DC: Office of Air Force History, 1985), 110-115.

¹³Gabel, *The US Army GHQ Maneuvers of 1941*, 37-39.

¹⁴Greenfield, *Army Ground Forces*, 109.

CHAPTER 2

BACKGROUND

All aerial observers must be composed of artillery personnel and be absolutely under the control of the artillery. We shall never get successful results by the methods that have been pursued in this war.¹

Major General Summerall,

Throughout history a critical component of victory has been the ability to learn the composition and disposition of the enemy. Great measures are taken to gain advantageous points on the battlefield to conduct this observation. As warfare evolved, field artillery moved to the forefront in the conduct of warfare. The positioning of this weapon's effects could turn the tide of battle. However, it was extremely dependent on the ability of observers to make necessary adjustments. The use of aerial platforms to gain the advantage of observation in American military history was first seen in the Civil War and expanded upon with the development of the airplane to perform this task during World War I.

The origins of aerial observation in the United States Army can be traced back to the start of the Civil War. On 6 June 1861, Professor Thaddeus S. C. Lowe arrived in Washington, D.C., to demonstrate the viable wartime employment of balloons. Before 1861, the technology of early balloons did not support this frail aerial platform in the harsh and environment of combat. Lowe was convinced that balloons had improved to the point that they could be a reliable platform for observation, reconnaissance, and the possible employment to direct artillery fires to increased accuracy.²

Although there were other aeronauts assisting in the development of this technology, Lowe achieved the greatest success and, as a direct result of his efforts, the

Balloon Corps was added to the Army of the Potomac on 25 September 1861. Lowe's achievements included the first telegraph from a balloon, but more importantly he directed the first adjustment of artillery from an aerial platform on 24 September 1861.

Lowe, after ascending above Fort Corcoran on the south bank of the Potomac River, used a telegraph to relay ranges of the Confederate advance and make adjustments to Union officers using maps he had marked on an earlier flight.³ Seeing the value the balloon provided, General McClellan used the Balloon Corps for continuous daily reconnaissance throughout the Peninsular Campaign. The Balloon Corps had its greatest success at the battle of Fair Oaks in June 1862.

The first tasking given to the Balloon Corps prior to the engagement was to locate suitable bridge sites to cross the swollen Chickahominy River. The site was quickly found and a bridge established. Lowe was the first to observe Confederate infantry and cavalry moving towards the Federal lines from Richmond. By noon on 31 May 1862, Lowe was able to determine that the route of march would place the Confederates in Fair Oaks. Lowe's observations pinpointed the Confederate advance to within four miles of Union lines. Lowe made a number of ascensions throughout the battle, continuing to gain insight on the enemy's actions. He also was the first to confirm that the Confederates were withdrawing back to Richmond.⁴

The success of the Balloon Corps was short lived. In 1863, the Balloon Corps was transferred to the Signal Corps. Funding for the Balloon Corps now resided within the budget of the Signal Corps, which had neither sufficient funding nor personnel to continue to support and employ these platforms. Without funding, the Balloon Corps was returned to Washington in June 1863 and disbanded. Balloons would return to the

battlefield with limited success in the Spanish American War and World War I. The balloon demonstrated the importance of aerial observation on the battlefield.

The introduction of the airplane to the Army in 1908 by the Wright Brothers would bring about a technological change that would have a long-ranging impact on the conduct of war throughout the twentieth century. By November 1912, the Army had twelve pilots, thirty-nine enlisted men, and twelve airplanes.⁵ The use of the airplane to perform aerial observation was seen as a significant evolution in the employment of artillery. The advantages of long-range fires and massed effects could now be made with greater accuracy.

The first American use of an airplane to perform observation and adjustment of artillery fire occurred at Fort Riley, Kansas, in 1912. At the request of the Field Artillery Board, two aircraft were sent to Fort Riley to conduct these test trials. The impact of these tests was described by then Lieutenant H. H. Arnold:

On the 5th of November, the airplane was used for the first time with the battery actually firing at a target. The target was about 3200 yards from the battery. It was a dark day, a dark target and a dark background for the target. In spite of this, the airplane picked up the target very easily. No 10, equipped with a wireless, went up first, sending back by wireless, the location of the target and afterwards the position of shots with reference to the target. These observations put the guns on target after about four volleys and the machine returned to the ground.⁶

These tests enthused the field artillery community with the added value of the airplane as a combat multiplier to enhance the effects of indirect fires on the battlefield. Ironically, Arnold would become the Chief of the Army Air Forces and the most active opponent of organic light aviation for the Army Ground Forces (AGF) to perform this task.

World War I greatly expanded the role of the airplane from that of an observation platform to a formidable weapons platform employed in the roles of liaison, observation,

close air support, and aerial interdiction. The development of the airplane in World War I that would have a lasting impact on shaping the doctrine and force structure of the interwar period.⁷

The Army's introduction to the combat employment of airplanes occurred in World War I on the Western Front. Prior to America's entry into the war, a number of articles were printed in the *Field Artillery Journal* expounding the merits of both airplanes and observation balloons to adjust artillery fires. Most notable of these was "Aviation as an Aid to Artillery," written by Captain Charet of the French Army. This article was translated and appeared in the *Field Artillery Journal* in 1914.⁸ The article initiated a framework for discussion within the U.S. Army Field Artillery on how to organize, train, and employ airplanes for the adjustment of artillery fires.

The U.S. Army understood the importance of aviation and made great use throughout World War I of both airplanes and balloons to support ground operations. The task of observation was of such value that it warranted the formation of an observation squadron (airplane) to support each corps in conducting artillery spotting. Although this organization was designed to support the needs of the artillery, the use of airplanes to conduct aerial adjustment of artillery fires met with limited success.⁹

The problem lay in the command relationship of the observers attached to the Air Service. In the early days of the American Expeditionary Force (AEF) deployment, artillery officers were detailed to support the Air Service in the adjustment of fires. These observers were artillerymen in name only, as they were assigned to the Air Service and had no interaction with the supported artillery headquarters.¹⁰ The observation aircraft would fly to the front, get their instructions by radio, and attempt to employ

artillery fires with no understanding of the ground tactical plan or the intent of the fires they were adjusting. Subsequently, many of the missions flown were unsuccessful. This attachment led to problems in training, integration, and administrative support. The artillery requested that the observers be retained within the artillery command. Here they would have a better understanding of the operations and the enemy situation. The general dissatisfaction with the arrangement by both the Air Service and the artillery prompted the AEF Headquarters to publish a policy regarding observers. On 9 August 1918 the AEF authorized aerial observers to be commissioned in the Air Service and be placed on equal footing with officers of the Air Service.¹¹ This policy was rescinded at the end of the war, but not before making an impression on artillery officers and senior leaders who would organize the Army for World War II.

The Hero Board was used to capture the lessons learned after World War I. Artillery officers in their remarks to the Hero Board made their position known on the use of the airplane, assignment, and training of observers and the command relationship. This early problem in air-ground cooperation began the rift between the air staff and the artillery that set the tone for the future development and employment of aviation in support of the field artillery during the interwar period.

At the close of World War I, the Air Service had thirty-nine aero squadrons conducting pursuit, observation, bombing, and reconnaissance.¹² In the eyes of the ground commanders, the success of the airplane was in its ability to perform observation and close air support (CAS). This view would be incorporated into the Army doctrine of the interwar period and be the source of controversy between the ground forces and the growing Army Air Corps (AAC) prior to World War II. The AAC, after World War I,

saw a greater use for the airplane as a bomber. The airpower theorists envisioned the airplane as a strategic platform of interdiction that could wage total war against an enemy not only aimed at his war machine, but the supporting population as well.

The AAC was consumed with building a stronger and autonomous force based on these new theories of airpower. To gain public support, the AAC demonstrated the role aviation played in both commerce and defense. The success of the airplane during World War I coupled with the growth in aviation industry during the interwar period provided an environment to expand on new concepts. These ideas were made possible by the great progress in aviation safety, reliability and capability. The greater reliability of airplanes opened the way for new ideas in the employment of aviation on the battlefield as well as developing doctrine to support these concepts.

The AAC, although eager to make great strides in all facets of aviation, suffered from the difficult economic times of the Great Depression. During the 1930s, the AAC in an effort to economize force structure and maximize the budget moved aerial observation and reconnaissance tasks into the National Guard. The task of these National Guard observation squadrons equipped with O-46 and O-47 aircraft was to conduct both reconnaissance and observation to include the task of "artillery spotting." By 1938, nineteen observation squadrons were formed, one to support each infantry division and the Air Corps itself.¹³ The tactics of employment for these squadrons were derived from the lessons of World War I. The squadrons would operate from fixed facilities located well to the rear of the front lines to conduct observation and reconnaissance for the ground maneuver commander.¹⁴ Ground commanders thought the benefit gained in

protecting the squadrons at bases away from the forward line of troops (FLOT) was lost in planning and integration.

Incorporating these tactics from World War I and exploiting the advances in aviation technology, the aircraft developed for these tasks grew heavier and faster. Although both the AAC and later the AAF embraced these attributes, the ability to support ground commanders relied on fixed base facilities that were far removed from their headquarters in the main battle area. Not all Army commanders saw the events of World War I dictating the future of armed conflict. Trends in Europe clearly showed that maneuver warfare would break any protracted stalemate by employing tanks, airplanes, and robust communications. Not only were the instruments for maneuver warfare enhanced, but also the doctrine to support close coordination and integration of combined arms warfare.

In 1939, the Board of Observation Airplanes in an effort to correct the gap in observation aircraft created by the shift in procurement of bomber and pursuit aircraft called for three types of observation and reconnaissance aircraft. The three types were: *liaison* (short range) which would support division requirements, *observation* to support corps and division missions beyond the FLOT, and *reconnaissance* to support army missions and reinforce corps and division requirements.¹⁵ The budget for this period only supported two platforms. As a result the liaison airplane, later to be named Short Range Liaison (SRL), was not funded.

Although the SRL program was not funded, the AAC continued to seek an aircraft that would meet the requirements of being able to operate in a more austere environment to support the observation and the artillery spotting requirement. The SRL program was

high on the agenda of the field artillery community. Proponents for the inclusion of light aviation in field artillery had been discussing potential platforms and working on the justification for the aircraft through articles in the *Field Artillery Journal*.

The technology for building short takeoff and landing (STOL) aircraft evolved during the Guggenheim Safe Aircraft Competitions. Daniel Guggenheim, a leading entrepreneur of the era, announced the creation of a fund in his name for the promotion of aeronautics. The purpose of this fund was to work with federal agencies to promote aeronautical education, assist in the development of commercial aviation, further the application aviation in commerce, and most importantly research specific aeronautical problems.¹⁶ Through a series of Safe Aircraft Competitions, the technology of STOL was introduced. The features of STOL aircraft included lower stall speeds, high-wing loading, and more efficient wing designs that incorporated slats and flaps to enhance short field takeoffs and landings.

The presentation of the German Fieseler Fi-156 *Storch* (Stork) during the Cleveland Air Races of 1938 by Ernest Udet and a subsequent visit to Wright Field sold the AAC leadership on the capabilities of STOL aircraft.¹⁷ Army officers were impressed with its handling characteristics and were convinced that these specifications be incorporated into the observation program to meet the requirements of the SRL platform. The Fi-156 was a high-wing, cabin monoplane with a long-stroke undercarriage, remarkably slow-flight characteristics and excellent observation made possible by a large cockpit. The secret of the aircraft's performance lay in the combination of leading-edge slots and full-span flaps, the latter being extended chordwise at the tips to further increase

the wingspan area.¹⁸ These qualities would be incorporated into an AAC specification for a new lighter class of observation aircraft that would fulfill the SRL program.

The primary aircraft then in use by the AAC for the observation mission was the O-46. This airplane was one of two types approved by the Board of Observation Airplanes. The O-46 was a high wing, all metal aircraft with slats and flaps and a maximum speed of 221 miles per hour. The aircraft's large size and high stall speeds required a large field for operations. This aircraft was typical of the period, demanding fixed facilities and extensive maintenance periods requiring special tools.¹⁹



Fig 2. O-46 Observation Airplane. Source: United States Air Force Museum.

The specification for a new observation aircraft issued by the AAC as a result of the Fi-156 demonstration and continued pressure from the field artillery community resulted in prototype introductions in 1940. The leading manufacturers Bellanca, Stinson, Ryan, and Curtiss provided prototypes for testing and evaluation. The two most promising prototypes came from the Curtiss and the Stinson Companies. The Curtiss

design utilized proven technology from their family of naval fighters. However, the Curtiss O-52 *Owl* was not much of an improvement over the O-46. Heavy, fast, and demanding the same intensive maintenance made even more complicated by the fuselage retractable landing gear. Never the less the AAC placed an order for 203 O-52s.²⁰ These aircraft were acquired to support the corps and division observation mission.²¹ The second prototype, by Vultee-Stinson, caught the attention of the field artillery community. The Vultee-Stinson design was close in terms of performance to the Fi-156. Easy to fly, it incorporated the STOL traits that would serve it well in the artillery-spotting role. The AAC issued the Stinson the designation O-49 and it went into parallel service with the O-52. An initial contract was awarded to Vultee-Stinson Aircraft for 142 O-49s.²² The addition of these two observation aircraft in early 1940 filled the requirements identified in the Board of Observation Aircraft findings. The AAC now felt confident it had sufficient types of aircraft to conduct observation, reconnaissance, and artillery spotting in support of the ground forces.

The design shortfalls of these aircraft would not become apparent until the 1941 General Headquarters (GHQ) maneuvers. These aircraft, when evaluated against the post World War I doctrine, met all the specifications called for by the AAC. Only when employed in support of the GHQ maneuvers did their flaws in operating from forward areas become apparent. Only the O-49 was capable of performing the task of observation from forward areas. The issue of command and control of the observation squadron was still to be resolved.²³ Problems with both of the aircraft and the command and control arrangements became apparent during the 1941 maneuvers.

The GHQ maneuvers of 1941 stemmed from the Protective Mobilization Plan (PMP).²⁴ The PMP was a solution to build up the capabilities of the Army after the lean interwar years. The senior leadership of the Army understood it needed a program to quickly assemble, equip, and train a combat ready force in time of emergency.²⁵ Another component of the PMP was the modernization of the Army encompassing doctrine, material, and organizations. The PMP set the conditions to prepare the United States for potential entry into World War II.

These maneuvers were graduate-level exercises that employed doctrine, emerging organizations and material developed to fight a future war in Europe. These exercises would evaluate the readiness of the Army through training objectives at the army, corps and division levels. On 15 January 1941, GHQ sent a directive to the four field armies outlining this training plan within the confines of the given time period to attain combat readiness in accordance with the PMP.²⁶ The exercises were scheduled to take place in the Carolinas, Louisiana, and Tennessee.

During the same time period, the War Department reorganized the Army Air Corps into the Army Air Forces in June 1941 to reflect the growing role of air power in national strategy. The AAF became an autonomous agency within the War Department. This decision was made to facilitate better organization and control. The reorganized AAF was divided into two subordinate major commands. The Air Force Combat Command responsible for tactical organizations and the Air Corps made up of all non-combat units (depots, training sites and maintenance sites).²⁷ The source of controversy within the AGF surrounding the AAF was that the reorganization provided an unchecked

shift from tactical support to aerial interdiction. The AGF saw that this shift in organizational focus by AAF placed air-ground cooperation at serious risk.²⁸

A product of the reorganization of the AAC into the AAF was the formation of Air Support Commands (ASC). The creation of the Air Support Command was a function of both the reorganization and in preparing for the GHQ maneuvers. The employment of large numbers of aircraft to support the maneuvers required an effective command and control structure.

In preparation for the maneuvers, ground commanders wanted direct control over aviation supporting their operations. They claimed that air support effectiveness was based on subordinating the air units to the maneuver commander. The AAF argued that placing air units under ground commanders would violate the concentration of effort. A compromise developed by the War Department in July 1941 led to the incorporation of ASC within each of the numbered Air Forces and a separate ASC for armored forces under Air Force Combat Command.²⁹

The ASC was designed as a close support command and control headquarters to support AGF with the employment of AAF units.³⁰ The ASCs were designed to facilitate close support to a ground force action. The organization of the ASC consisted of observation and reconnaissance aircraft, troop transports, light bombers and dive bombers.³¹ The ASC also could be assigned tailored packages of bombers and fighters from the numbered air force's interceptor and bomber commands for short durations. Aircraft would be employed based on the ground tactical plan or operational requirements to support the ground commander.

The allocation of observation squadrons to the ASC depended on the supported AGF headquarters. The common AGF headquarters supported was the infantry corps. The ASC supporting an infantry corps consisted of an observation group consisting of one medium and one light observation squadron. Medium observation squadrons were assigned to those ASCs supporting an armored or cavalry corps. Separate armored or cavalry divisions were authorized one medium observation squadron to the supporting ASC.³²

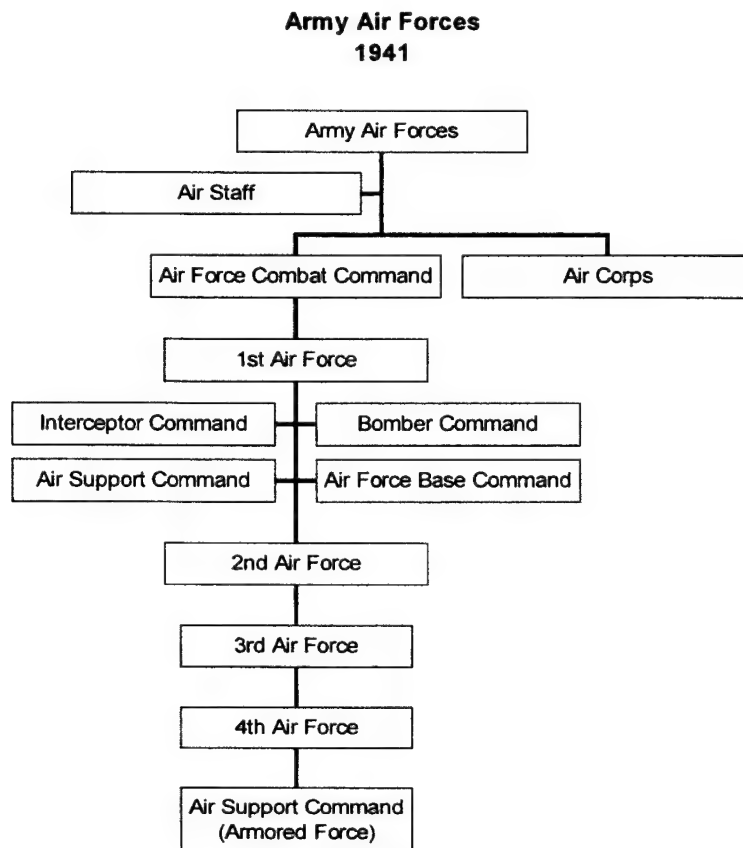


Fig. 2. Organization of the Army Air Forces 1941. Source: Ivan L. Foster, "With the Other Arms and Services," *Field Artillery Journal* 31 (December 1941), 969.

The concept was sound and mutually supported by both AAF and AGF senior leadership. But the results of the GHQ maneuvers would leave both the AGF and the AAF leadership with mixed opinions on the effectiveness of the ASC. The controversy at the end of the GHQ maneuvers was focused on the effectiveness of airpower in supporting the ground tactical scheme of maneuver. Command and control, apportionment, mission taskings and targeting were scrutinized. The impact on the AAF was in generating sufficient observation squadron sorties to perform both reconnaissance and artillery spotting. The problems encountered by the ASC in providing sufficient aircraft to support all of the field artillery observation requirements demanded that proponents of the inclusion of light airplanes in the field artillery act immediately while this issue hung in doubt with the senior Army leadership.

The AAF continued to refine the ASC, but not at the pace or with the command and control relationship the AGF was seeking. Parallel to the developments taking place in the AAF, the AGF began experimenting with light airplanes in the late 1930s. Many of these tests took place outside of normal AAF and AGF channels.

The introduction of commercial light airplanes into the GHQ maneuvers was the result of a combined approach by the field artillery community and the leading manufacturers of general aviation aircraft. Throughout the interwar period from 1920 to 1939 articles in the *Field Artillery Journal* discussed the merits of light aircraft to assist the artillery. These articles discussed the use of light aircraft to support coastal artillery in defense of ports and harbors, autogiros to adjust artillery fires and the development of specialized observation aircraft to support distant interdiction and counter battery.³³ In

addition to these professional articles on the subject, a few officers in both the active and reserve components began experimenting with light airplanes.

Major General Robert Danford, Chief of the Field Artillery, was convinced that air observation was essential to the effective use of artillery. He ordered a study of the use of balloons and airplanes in supporting artillery in World War I. The results of this study concluded that for aerial observation to work it must be conducted using trained artillery observers that were familiar with the employment of artillery weapons.³⁴ In 1940 he was given the opportunity, during a liaison visit to England, to observe the Royal Artillery's air observation post. The Royal Artillery was the first to adapt light airplanes to support field artillery observation. Danford returned to the United States committed to the idea of using general aviation airplanes in this role and sought permission from the War Department to conduct experiments with this idea. The request was denied, but did not prevent the continued professional discussion and dissemination of the idea within the artillery community. This indirect approach planted the seed of this concept not only throughout the artillery community, but the Army as a whole.

Parallel to these official observations and requests for testing was the testing and utilization of light planes by individual active and reserve officers. In 1937, several National Guard officers rented light airplanes to incorporate into training at their own expense. Most notable of these private experiments were those conducted by Lieutenant Joseph Watson and Captain John Burr of the Texas National Guard's 61st Field Artillery Brigade.³⁵ Lieutenant Watson began his interest in aviation returning to Texas after graduation from college. Within a year he had accumulated fifty hours and had become

the 6,619th person to be awarded his pilot certificate by the Civil Aeronautics Authority (CAA).³⁶

Captain Burr and Lieutenant Watson conducted trials using rented Piper J-3 *Cubs* from Stinson Municipal Airport in San Antonio. They established air-ground communications, tested the use of artillery radios and directed convoys from the air. Impressed that their idea was feasible, they requested the commander of the 61st Field Artillery Brigade, Brigadier General Robert Whitaker, to invite a representative from the Piper Aircraft Company to take part in the next scheduled exercise. During maneuvers at Camp Bowie, Texas, Mr. Tom Case of the Piper Aircraft Company participated using a J-4 *Cub Coupe*. Watson and Case conducted a number of demonstrations. The results proved so beneficial that Lieutenant Watson, endorsed by Case, requested that Piper participate in additional maneuvers scheduled in August 1940 at Camp Beauregard, Louisiana. The exercise once again proved beneficial. Again Case and Watson demonstrated the capabilities of the light plane by adjusting fires and directing the brigade on a ninety-three mile road march from the firing ranges to their bivouac at Cavens, Louisiana. Although the test was impressive, there were still a number of deficiencies to be overcome in communications. Case and Watson remained in contact after he returned to the Piper plant in Lockhaven, Pennsylvania, to work out the problems with radios and signaling devices.

The significance of the light plane was impressed upon BG Whitaker. He was impressed by the rapid engagement of the targets and the minimum number of rounds used to achieve target effects. He surmised that the cost savings in ammunition alone would be sufficient to pay for the addition of light planes in the artillery.³⁷ Another

experiment conducted in February of 1941 by invitation of the Commander of the Armor School, General Chaffe, involved evaluating light planes to direct mechanized columns from the air.³⁸ This too was a successful test involving the direction of mechanized columns and aerial reconnaissance of march routes.

With the success of these previous experiments, William T. Piper, Sr., began a lobbying effort to persuade the War Department of the value of light aviation. He drafted a proposal to be hand carried to Washington by the senior director of the company Mr. John E.P. Morgan. The proposal outlined how light airplanes could be used in military cooperation. Some of the suggestions Piper included were (1) control troop movements, (2) evacuate wounded, (3) carry messages, (4) ferry personnel, (5) scout, (6) patrol, (7) drop bombs or torpedoes, and (8) be used for instrument training (IFR).³⁹ On 24 March 1941 Robert A. Lovett, Special Assistant to the Secretary of War for Air, replied that he liked the suggestions and thought that the ground forces would be interested in items (1) to (4), but at present there were neither funds nor personnel available to pursue these items within the War Department.⁴⁰

The idea was now set in the minds of some of the top decision makers in Washington. Now Piper needed a format to demonstrate the capabilities of the light plane. That opportunity came when the Second Army was to conduct GHQ maneuvers in Tennessee and the AAC had no observation aircraft to spare. Assistant Secretary Lovett wrote Morgan suggesting the use of light aircraft to support the maneuvers.⁴¹ At their own expense, the general aviation manufacturing community supplied twelve airplanes and pilots.

Morgan's aircraft arrived in June. The experiment at Camp Forrest, Tennessee, was less than ideal. Problems with prearranged signals, orders dissemination and the inclusion of civilian pilots into the maneuvers detracted from the benefits the aircraft provided. The limited success achieved despite these problems reinforced the capability of light airplanes.

Instructions went to Lieutenant General Leslie McNair, Chief of Staff, General Headquarters, to prepare the remaining maneuver armies of the GHQ maneuvers to receive the light airplanes. General McNair was well versed in aerodynamics and a supporter of light aviation. He contributed a detailed article to the *Field Artillery Journal* on the use of the autogiro in 1937 to support the artillery observation.⁴² The exercising units were directed to sell the civilian pilots gasoline and oil and the companies were to furnish their own pilots and mechanics to participate in the scheduled maneuvers.⁴³

The light airplanes would perform liaison, courier, and artillery spotting during the maneuvers. The primary focus would be support to the field artillery. Upon the conclusion of each maneuver period, a series of questions were to be answered by both the division artillery and artillery brigade commanders:

- a. What was the basis of assignment of airplanes to the Field Artillery by the division or corps commander?
- b. Were observation airplanes available in sufficient numbers to meet your requirements?
- c. How many requirements for airplanes were made and how many were answered by the timely arrival of the airplanes in or over your area?
- d. What was the average length of time necessary to make an airplane available after the request was made?
- e. How many successful reconnaissance and observation missions were there and how many unsuccessful?
- f. Was liaison with the observation aviation attached to the corps or division satisfactory?

- g. Based upon your experience with air observation for Field Artillery in the maneuvers reported upon, do you consider the present method of assignment of airplanes to units by division or higher commanders satisfactory?
- h. Considering the difficulties and additional responsibilities involved, your opinion is desired as to whether short-range liaison and observation airplanes and their operating and maintenance crews should be provided as an organic part of the division or coast artillery brigade. Give brief reasons for your answer.⁴⁴

The answers to these questions would also indirectly answer the effectiveness of the support provided by the ASCs in providing observation sorties.

The GHQ maneuvers in Texas later that summer continued to show the capability of light airplanes in supporting the ground forces. Undaunted by the lack of success enjoyed during the Tennessee maneuvers, the fleet of light airplanes was increased by two more aircraft to take part in the maneuvers at Fort Bliss. The aircraft were assigned to the 1st Cavalry Division commanded by Major General Innis P. Swift. These maneuvers would provide the payoff that the artillery community had been waiting for since their inclusion in the maneuver schedule. The aircraft operated in extreme environmental conditions and proved their ruggedness by landing everywhere and anywhere. They proved they were durable and easily repaired in the field, but most importantly proved adept at close coordination with the 1st Cavalry Division, unlike the AAC observation squadrons.

The biggest compliment that could be paid to the fleet came in response to an order issued by the GHQ exercise headquarters. The AAF, flying a combination of O-46 and O-49 observation aircraft, consistently crashed or damaged their aircraft when attempting to land on unimproved airstrips. As a result, GHQ ordered that no military

aircraft were to land on newly prepared surfaces until the light planes had been operating from it for a minimum of forty-eight hours.⁴⁵

The fleet earned their nickname "Grasshoppers" during this exercise as well. Major General Swift frustrated at trying to send a radio message from his headquarters fifty miles north of El Paso exclaimed, "Send a Grasshopper down to Biggs Field." "What's a Grasshopper?" asked the aide. "They'll know when you tell them." The name stuck and within a month "Grasshopper" lapel pins and fuselage markings appeared on the fuselages of the airplanes.⁴⁶

The exercises in the Texas desert proved successful for both the 1st Cavalry Division and the field artillery. Additional tactics, techniques and procedures were refined based on the previous experience and would be modified by the factory pilots for the next series of maneuvers. The responsiveness and the number of sorties generated was exactly what the field artillery was looking for in aerial observation.

The Louisiana maneuvers, the second largest of the GHQ exercise plan, proved to be another success story for the advocates of organic light aviation. The light planes were routinely used to observe the maneuvers by the senior leadership that was participating. During the course of one of these flights, Colonel Dwight D. General Eisenhower, then Chief of Staff for Third Army, utilized an assigned J-3 *Cub* to get a better picture of the exercise. He also took advantage of this opportunity to demonstrate his adept skills at handling the airplane. Eisenhower was an advocate of general aviation and had earned his pilot's certificate while stationed in the Philippines.

The Third Army immediately saw the practicality of the light airplane and wanted to ensure their availability for the next series of maneuvers. The next scheduled exercises

in Louisiana were between Second and Third Army. Third Army negotiated a simple contract with Piper through the Quartermaster General to ensure participation in the exercise. This rental agreement again solidified the relationship of the general aviation industry with the AGF.⁴⁷

The fleet of light airplanes served in both phases of the Louisiana maneuvers and quickly earned the respect of both the red and blue exercise corps and divisions. The newly developed ASCs provided insufficient sorties to support the AGF throughout the exercise with many observation taskings going unanswered. As a result of these teething problems, primarily associated with the command and control of tactical aviation, many observation and reconnaissance requests went unfilled.⁴⁸ The light planes were first to fill these voids and demonstrated their capability of performing limited reconnaissance.

The final set of maneuver exercises conducted by the GHQ was the Carolina Maneuvers. The largest of the exercises, they also included contracted planes and pilots supporting the field artillery. The difficulties of employment and communication continued to be refined based on the lessons learned during the previous exercises. The *Grasshopper Squadron*, as the fleet had come to be known, participated in both phases of these exercises and enjoyed great success.⁴⁹

The exercises proved the overall effectiveness that could be achieved by employing light airplanes to adjust artillery fires. The conclusion of the exercises left the field artillery in a position to readdress the assignment of organic light aviation. The field artillery community also enjoyed an overall acceptance of the plan within the AGF.

Armed with the success of light airplanes during the GHQ maneuvers, General Danford once again submitted a recommendation to the War Department. The G3, War

Department, rejected the recommendation and thought that light aviation was still premature. General McNair concurred because he wanted to allow the ASC problems to be ironed out first.

Finally realizing that the AAF would not be able to meet the requirements of supporting the AGF with sufficient air support while attempting to build a capable air force, General McNair reluctantly ordered a test of light aviation in support of field artillery. The test used a corps artillery brigade and an infantry division. The test would concentrate strictly on the employment of light aviation in the artillery spotting role. The surprise attack on Pearl Harbor postponed the test, but on 25 February 1942 the 2d Infantry Division and the 13th Field Artillery Brigade were named as the test units.⁵⁰

The test organization was composed of fourteen officers and twenty-one enlisted men with civilian pilot licenses from the field artillery. These members became known as the "Class Before One" and after the conclusion of the tests filled the training cadre of the Air Training Department at Fort Sill, Oklahoma. The group was broken into two flights. Flight A joined the 13th Field Artillery Brigade at Fort Bragg, North Carolina. Flight B joined the 2d Infantry Division at Fort Sam Houston, Texas. The test were conducted from 1 March to 16 April 1942. The series of test included: (1) adjustment of artillery fire, (2) general and road reconnaissance, (3) column control, (4) selection of battalion assembly areas, (5) identification of enemy batteries, (6) conducting prearranged fires, (7) surveillance of fire; and (8) battery camouflage checks.

In addition to these tests performance evaluations were conducted between the O-59s (L-4) and the AAF observation airplanes. The test focused on the adjustment of fires.

The results were that on average it took the AAF thirty minutes to adjust rounds on to the target and a mere ten minutes for the O-59s.⁵¹

The O-59s also took part in a two-day survival exercise against P-40 pursuit aircraft. The umpires concluded that the gun camera footage clearly showed that the O-59s were destroyed in the recorded engagements, which led the AAF to question the survivability of these light planes in vicinity of the front lines. Unofficially, AAF observers concluded that the survivability comments were not conclusive. They felt that the O-59 flying at treetop level within range of friendly lines would be able to outmaneuver the fighters and that antiaircraft support would limit the effectiveness of enemy fighters operating against the air OPs.⁵²

Both the 2d Infantry Division and the 13th Field Artillery Brigade reports concluded that light aviation organic to field artillery for the purpose of artillery spotting was exceptionally sound. The test units also recommended an initial allocation of equipment based on the combined experience from the GHQ maneuvers and the test they performed.

With these new findings and operating against a deadline the War Department issued a memorandum directing the inclusion of light aviation for field artillery.⁵³ At the same time it made clear that the AAF was to share in the responsibility for the aerial adjustment of artillery fire. The War Department issued the directive in the absence of General McNair to meet suspense. General McNair did not think the tests conclusive, but soon became aware of the program's value and gave it his full support. His staunch support of the program later proved valuable in confrontations with General Arnold during AAF attempts to capture this air arm under AAF control.⁵⁴ This memorandum

also provided the initial allocation of personnel and equipment based on the test findings and assigned responsibility to both the AGF and the AAF for the training, maintenance and sustainment of this organization. The AAF, however begrudgingly, accepted the memorandum and with the cooperation of the Civil Aeronautics Authority began the process of selecting, training, and equipping the AGF with light aviation.

Organic aviation would continue to be an issue of great controversy throughout the war years. General Henry "Hap" Arnold, Chief of the Army Air Forces, was adamant that there was no requirement for organic aviation in the AGF. The AAF thought it a grievous waste of resources to build an organic aviation capability for the AGF. General Arnold continually pressed the War Department and the Secretary of War to rescind the directive. Throughout the course of the war General Arnold made several attempts to have organic light aviation moved under the control of the AAF.

The first attempt was based on the poor coordination in selecting and training observation pilots for the AGF. Per the War Department directive, both the AAF and the AGF were responsible for providing pilots for organic light aviation. The matter of selection, training and responsibilities of the pilots differed greatly between the AGF and the AAF until ultimately the War Department resolved the problem. Unfortunately for General Arnold and the AAF, the Assistant Secretary of War was strong supporter of organic aviation. In August 1942, the Assistant Secretary of War notified General McNair of General Arnold's intent to reopen the issue of organic aviation with the intent of moving it under AAF control. General McNair signed a memorandum to the AAF that read in part:

The field artillery had waited for many years for proper air observation, with disappointing results; that sheer necessity had forced the present procedure, that the proper outlet for the AAF in this connection lay in demonstrating with the regular observation units that the AAF could and would give the sort of observation that was so vitally necessary under modern conditions, and if and when they gave a convincing demonstration of this kind it would be time to discuss a change, but not before.⁵⁵

Although General McNair was reprimanded by the G-3, War Department, for this correspondence, the AAF agreed that it would no longer take action on this issue and the War Department regarded the issue closed. This was not to be the case.

Another attempt to gain control of organic aviation by the AAF occurred in January 1944. This attempt would quell the issue of organic aviation between the AAF and the AGF. AAF senior leaders were alarmed at the attempts of the AGF to obtain higher performance aircraft. In addition they were concerned about the expanded use of the L-4 for other than artillery support. This perception by the AAF was expressed in a memorandum by General Arnold to have control of organic aviation transferred to the AAF. In this memorandum, Arnold charged that organic aviation was overextended, that it was being diverted from its primary mission and that it was a waste of resources. He continued in the memorandum to articulate his previous position that these resources be consolidated and placed under centralized control as part of the newly formed liaison squadrons.⁵⁶ The problem with the AAF argument was that it failed to provide one liaison squadron to support the AGF by 1944. The War Department once again ruled that the AGF could retain its organic aviation. The AAF would eventually recognize the need for organic light aviation as a critical component to the AGF. By the end of the war, they also supported the expansion of this capability into other branches of the AGF.

With the creation of an organic aviation capability for the AGF, the War Department was faced with building two air arms simultaneously. The reorganization and the program to expand the AAF to fifty-four groups posed many challenges to overcome in fielding light aviation to the field artillery.⁵⁷ The issues facing the AAF and the AGF included resource diversion, pilot training and responsibility for employment.⁵⁸ The challenge facing the AGF was developing the doctrine, training, organization and material solution sets that we utilize today to develop this new force structure.

¹H. W. Blakeley, "We Must See with Our Own Eyes," *Field Artillery Journal* 29 (May-June 1939): 215.

²J. David Truby, "Pesky Ships of the Air," *Military History*, February 1988, 8.

³*Ibid.*, 58.

⁴*Ibid.*, 60.

⁵Richard Tierney, *The Army Aviation Story*, ed. Fred Montgomery (Northport, AL: Colonial Press, 1963), 35.

⁶Henry H. Arnold, "The Air OP Was Very Young," *Field Artillery Journal* 36 (April 1946): 199.

⁷Thomas H. Greer, *The Development of Air Doctrine in the Army Air Arm, 1917-1941*, U.S. Air Force Historical Studies No. 89 (Maxwell AFB, AL: Air University Press, 1955), 40-41.

⁸Charet, "Aviation as an Aid to Artillery," trans. James A. Merit, *Field Artillery Journal* 4 (1914): 562-576.

⁹Laurence B. Epstein, "Army Organic Light Aviation: The Founding Fathers," *U.S. Army Aviation Digest* (June 1977): 2.

¹⁰Blakeley, "We Must See with Our Own Eyes," 215.

¹¹*Ibid.*

¹²Tierney, *Aviation Story*, 38.

¹³Ken G. Wakefield, *The Fighting Grasshoppers: US Liaison Aircraft Operations in Europe 1942-1945* (London: Specialty Press, 1990), 11.

¹⁴Howard K. Butler, *Organic Aviation in the Ground Arms, 1941-1945* (Washington, DC: Government Printing Office, 1992), 5.

¹⁵*Ibid.*, 80-85

¹⁶C.V. Glines "Guggenheim Safe Aircraft Competition," *Aviation History*, November 1999, 39-44, 78.

¹⁷Andrew Ten Eyck, *Jeeps in the Sky: The Story of the Light Plane* (New York: Commonwealth Books, 1946), 19.

¹⁸J.R. Smith and Antony L Kay, *German Aircraft of the Second World War* (Baltimore, Maryland: Nautical and Aviation Publishing Company, 1972), 144.

¹⁹Butler, *Organic Aviation*, 28.

²⁰Butler, *Organic Aviation*, 86.

²¹Phillip Andrews, *Air News Yearbook* (New York: Duell, Sloan & Pearce, 1942), 55-56.

²²Wakefield, *Grasshoppers*, 12.

²³One of the issues between the AGF and the AAF on the utilization of light planes was command and control. The AAF preferred centralized command and control. This concept was in keeping with the AAF doctrine. The AAF developed doctrine to support the idea of a separate service. This issue is beyond the scope of this study and is well documented in Thomas H. Greer, *The Development of Air Doctrine in the Army Air Arm, 1917-1941*, U.S. Air Force Historical Studies No. 89 (Maxwell AFB, Alabama: Air University Press, 1955).

²⁴Gabel, *The U.S. Army GHQ Maneuvers of 1941*, 44.

²⁵*Ibid.*, 9.

²⁶*Ibid.*, 44.

²⁷Ivan L. Foster, "With The Other Arms and Services: The Army Air Forces," *Field Artillery Journal* 31 (December, 1941): 969-973.

²⁸William K Kay, "The Army Aviation Story," *U.S. Army Aviation Digest* (June 1961): 1-2.

²⁹Foster, "The Army Air Forces," 971.

³⁰Gabel, *GHQ Maneuver*, 57.

³¹Foster, "The Army Air Forces," 971.

³²U.S. Army, FM 31-35, *Aviation in Support of the Ground Forces* (Washington, DC: Government Printing Office, 9 April 1942), 20.

³³A. Verdurand, "Flying Observation Posts for Artillery," *Field Artillery Journal* 29 (May-June 1939): 200.

³⁴Epstein, "Army Organic Light Aviation," 2.

³⁵Wakefield, *Grasshoppers*, 13.

³⁶Epstein, "Army Organic Light Aviation," 4.

³⁷*Ibid.*, 5.

³⁸Tierney, *Aviation Story*, 43.

³⁹Devon Francis, *Mr. Piper and His Cubs* (Eagan, MN: Flying Books International, 1996), 80.

⁴⁰*Ibid.*

⁴¹*Ibid.*, 82.

⁴²Lesley J. McNair, "And Now the Autogiro," *Field Artillery Journal* 27 (January-February 1937): 5-17.

⁴³Tierney, *Army Aviation Story*, 46.

⁴⁴Butler, *Organic Aviation*, 167.

⁴⁵Francis, *Mr. Piper and His Cubs*, 84.

⁴⁶Ten Eyck, *Jeeps in the Sky*, 23.

⁴⁷Francis, *Mr. Piper and His Cubs*, 86.

⁴⁸W. S. Nye, "Lessons From the Maneuvers," *Field Artillery Journal* 31 (December 1941): 914-916.

⁴⁹John W. Kitchens, "Organic Army Aviation in World War 2: Part I 1940-1943," *U.S. Army Aviation Digest* (May-June 1992): 3.

⁵⁰Tierney, *Army Aviation Story*, 50.

⁵¹Epstein, "Army Organic Light Aviation," 17.

⁵²*Ibid.*

⁵³Butler, *Organic Aviation*, 22.

⁵⁴Epstein, "Army Organic Light Aviation," 17.

⁵⁵Kent R. Greenfield, *Army Ground Forces and the Air-ground Battle Team Including Organic Light Aviation*, Study No. 35 (Washington, DC: Government Printing Office, 1948), 26.

⁵⁶John W. Kitchens, "Organic Army Aviation in World War II: Part 2, 1944-1946," *US Army Aviation Digest* (July-August 1992): 17.

⁵⁷Foster, "With The Other Arms and Services," 970.

⁵⁸William K. Kay, "Army Aviation Story," *US Army Aviation Digest* (June 1961): 1.

CHAPTER 3

DEVELOPMENT

The primary mission of organic field artillery air observation is to supplement ground observation by locating appropriate targets and adjusting artillery fire.¹

FM 6-150, 20

The U.S. Army faced a number of challenges integrating organic aviation into the Field Artillery Branch. The concern in the War Department was how to develop two air arms simultaneously while competing for limited resources. The reorganization of the AAC levied requirements against the War Department to meet the expansion goals established by the President. These goals were established to provide sufficient force structure in terms of personnel and aircraft developed for a war in Europe. Faced with these challenges and responding to the needs of the AGF for organic aviation in field artillery units, the War Department set about to quickly fill these requirements by dividing the responsibilities for organic aviation between the AGF and the AAF.² The proponent of organic aviation in the AGF was the US Army Field Artillery School. The school developed the Department of Air Training for building this new organization. The Department of Air Training was responsible for developing the doctrine, organization, training and material to support this organic capability.



Fig. 3. Patch of the Field Artillery School, Department of Air Training.
Source: Ken G. Wakefield, *The Fighting Grasshoppers*, 1990.

Doctrine

The first hurdle faced by the Department of Air Training was developing doctrine to support the application of organic aviation in support of artillery. The preexisting controversy between the ground forces and the air forces was over the employment of airpower on the battlefield. The AAC had developed doctrine for observation and reconnaissance based on experiences from World War I and technological advances in airplane design during the period between the wars. The primary interest of the AAC, however, was in developing doctrine to support the bomber as a strategic and operational weapon. This idea diverted the focus from the development of air-ground cooperation and integration by the AAC. Generals Mitchell, Arnold, and Spaatz were among the number of Air Corps leaders who envisioned the airplane as a revolution in the art and science of war. This view of the airplane as a strategic weapons platform shaped the AAF doctrinal development prior to and throughout World War II.

At the close of World War I, the Air Service of the AEF compiled a prioritized list of aviation support based on after action reports, manuals and unit histories. The list identified observation as the second most important aerial task in supporting the ground commander.³ The War Department General Staff's 1922 Training Regulation 10-5, *Doctrines, Principles, and Methods*, stated that in war "the primary objective would be the destruction of his armed forces," further explaining, "all air action was auxiliary to the ground battle." Even though airmen of the time understood their supporting role, they looked at the experiences of World War I and thought it wasteful to employ aircraft at targets within the range of artillery fires.⁴

The AAC, acting under greater autonomy through the Air Corps Act of 1926, began shifting its priority to strategic bombardment over other air support tasks. General Billy Mitchell, like Giulio Douhet, believed that the airplane used as an instrument of strategic decision would win future wars. With this idea of strategic bombardment firmly established in the leadership of the Air Corps, it was just a matter of time before a revolution in airpower doctrine emerged to support this premise. The pursuit of airpower as a stand-alone arm would dominate the doctrinal development for the employment of airpower during the interwar period at the Air Corps Tactical School.⁵

Prior to April 1942, the AAF doctrine was encompassed in six field manuals. These manuals were FM 1-5 *Employment of Aviation of the Army*; FM1-10 *Air Attack*; FM1-15 *Air Fighting*; FM 1-20 *Air Reconnaissance and Observation*; FM 100-15 *Airdrome Defense* and FM 1-45 *Air Signal Communication*. FM 1-5 and FM 1-20 captured the observation doctrine to support the AGF. When the GHQ developed the maneuver exercises to prepare the Army for war it incorporated many new technological innovations and the doctrine that had been developed to date. The doctrine employed during the GHQ maneuvers was simply an amplification of the doctrine founded during World War I and expounded on during the interwar period to meet the introduction of new technologies and organizations. The cornerstone document for aviation employment was FM 1-5, *Employment of Aviation of the Army*, published in 15 April 1940.

The manual covered four areas: combat aviation, bombardment aviation, pursuit aviation and reconnaissance and observation aviation.⁶ This capstone document provided an overview of the organization, employment and the mission profiles of the AAC to support the Army. Chapter 5, "Reconnaissance and Observation Aviation," outlined the

basis of allocation of squadrons and the function and roles of reconnaissance, observation and liaison aviation to support the Army.⁷ The doctrine was sound on paper, but it failed to meet AGF expectations during the GHQ maneuvers.

The AAF, after its reorganization in June 1941, replaced FM 1-5 with FM 31-35, *Aviation in Support of Ground Forces* (dated 9 April 1942). FM 31-35 attempted to correct earlier deficiencies in the doctrine identified during the GHQ maneuvers and also included the new Air Support Command designed to provide better air-ground cooperation. FM 31-35 reflected a departure from the concepts of support outlined in FM 1-5. The manual prescribed the organization, functions and employment of aviation in support of ground forces. The centerpiece of this support was the new ASC. The manual described the function, role, and organization of the ASC. A notable change in FM 31-35 from the original ASC design was in the organizational structure. The ASC would be assigned to a theater army or task force commander. The organization also eliminated all organic attack, light bomber, and transport aviation from the original design template. Only the observation squadrons remained organic to the ASC commander. The function of the ASC commander was to act as the senior advisor to the ground force commander, distribute aviation to support the ground commander's plan and, when not directly employed to support the ground commander, employ aviation at appropriate targets with in the area of operation.⁸ This responsibility was a key component of the AAF goal to exhibit greater control of air assets to attack targets beyond the front line. This manual also supported the AAF concept of centralized control of air assets. The AAF believed that more efficiency could be gained by this command and control arrangement. The

AGF's position was that this reorganization of the ASC removed critical support assets and made air-ground cooperation more difficult to exercise.

The capstone document for the employment of observation and reconnaissance aircraft was FM 1-20, *Tactics and Technique of Air Reconnaissance and Observation* (dated 20 April 1942). FM 1-20 addressed the employment and functions of AAF aviation conducting these missions. The delineation of missions was based on the type of platforms performing those tasks. Observation platforms were broken into two categories: high performance and low performance airplanes. The tasks associated with the low performance airplanes were those required by the AGF to perform reconnaissance and observation. The missions associated with low performance aircraft included artillery observation, limited tactical reconnaissance, and liaison in the rear of friendly front lines.⁹ The manual included lessons learned from the GHQ maneuvers in that it addressed the specific information requirements for observation and reconnaissance units to obtain for infantry, cavalry, artillery, and mechanized commanders.

FM 1-20 detailed the tactics and techniques for the adjustment of artillery weapons into the categories of coastal artillery and mobile artillery. Section V provided an overview of the scope and requirements for the adjustment of fire for mobile artillery. The section provided the definition of terms, missions and aircraft assignment, and role of the observer.¹⁰ The release of this manual occurred sixty days prior to the Secretary of War's authorization to the field artillery to establish organic aviation. The manual provides insight into three issues of the controversy between the AAF and the AGF that assisted in the AGF argument for an organic aviation capability in the field artillery.

These three issues concentrated on allocation of aircraft, responsibilities of the crewmembers and command and control.

The allocation of observation aircraft did not change as a result of the GHQ maneuvers with the exception that the ground commander made aircraft apportionment decisions.¹¹ Aircraft provided by the AAF by way of the ASC were not broken down into liaison and observation sections. The ASC arrived at the supported unit with one squadron capable of general support to perform these missions. The type and number of aircraft assigned to the observation squadron depended on the unit the ASC was to support. The squadron size ranged from twelve to thirty-two aircraft depending on the type of aircraft assigned to the observation squadron. The AAF doctrine also stated that the missions assigned to observation aircraft should be those, which cannot be executed conveniently or accurately by ground observers.¹² The artillery community thought that this statement limited the ability to extend the range of both observation and fires. Their intent was to have multiple observers on the ground and in the air that would enable them to identify and engage a greater number of targets.

The second issue with FM 1-20 involved crewmember responsibilities. The AAF was only responsible for flying an observer provided by the artillery commander.¹³ The responsibility for signal communications, battery employment and adjustments were those of the air observer. The only responsibility of the pilot was to maneuver the airplane.¹⁴ The responsibility for observation was of the observer who was a nonrated crewmember. The AAF insisted that these observers must be qualified aerial gunners to conduct missions in the vicinity of active enemy air operations.¹⁵ The Field Artillery School could train sufficient observers to perform aerial observation, but did not have the

means to train them as aerial gunners. They also thought that the pilot must be familiar with artillery doctrine to enhance his situational awareness in performing this task.

Understanding the capabilities and limitations of both friendly and enemy artillery would be useful in the positioning of the airplane to conduct aerial adjustment procedures.

The last issue was in command and control of the observation assets. The success in using aircraft to perform aerial adjustment of artillery fires was in the responsiveness of the aircrew to support the designated battalion. The ASC method of allocation and apportionment did not provide flexibility or proper planning time to make it effective. The aircraft and crews needed to be familiar with both the scheme of maneuver and fires for the operation. The artillery's position was that command and control must be with the ground commander to ensure unity of effort. This was based on the experience of World War I and the GHQ maneuvers. The lack of responsiveness by the ASC necessitated that dedicated aircraft and trained observers be incorporated into the field artillery for this task. The artillery advocates for organic aviation supported by both the participating corps and division commanders thought this task too critical to be conducted on an ad hoc basis.¹⁶

The next AAF doctrinal publication associated with the implementation of organic aviation for field artillery was an update to FM 1-5, *Employment of Aviation of the Army* (dated 18 January 1943). This update of the 1940 manual included changes in employment and organization since entry into World War II. The updated FM 1-5 now addressed the lessons learned from combat operations in both North Africa and the Southwest Pacific. Section III of FM 1-5 addressed the functions of observation aviation, the enhanced organization and the expanded missions.¹⁷ The most significant change

was that it now identified AGF organic aviation as the primary unit with responsibility for the adjustment of artillery fires.¹⁸ AAF observation squadrons would perform this function only when requested and when there were no AGF aircraft available to perform this task.¹⁹

The Field Artillery School could use the basic doctrine for aerial artillery observation found in FM 1-20. Other aspects of observation for employment of organic aviation would need modification to express the scope and environment under which they would operate. It would not be until 1944 when the War Department released doctrine for air sections. The AGF published FM 6-150, *Organic Field Artillery Air Observation* (dated 30 August 1944) to formalize many of the theater developed TTPs that were being incorporated at the Field Artillery School. FM 6-150 provided standardized tactics, techniques, procedures, and guidelines for unit training. Prior to this time, the pilots received formal training in flying, adjustment of artillery fires, and communications. The issue was that each artillery organization developed its own standard of continuation training for pilots on arrival to a specific unit or theater. An aircrew-training manual did not exist and as a result these practices varied greatly from unit to unit and from theater to theater.

FM 6-150 reflects many of the recommendations of the Conference of Corps Artillery Officers and Army Artillery Officers held at the Field Artillery School from 26 to 28 January 1944. This conference was held to disseminate lessons learned and make recommendations for changes in artillery doctrine. One of the issues of the conference was the training of pilot observers. Accidents, maintenance and pilot proficiency in each of the theaters of war demanded a modification to the existing practices. The board's

recommendation was that centralized basic and field training would provide greater efficiency and produce more effective pilot observers.²⁰ They also recommended that the corps artillery and group artillery air officers be responsible for the supervision of continuation training.

FM 6-150 standardized artillery adjustment, administrative responsibilities, command and control, flight training and required maneuvers, environmental flying, and special missions.²¹ This standardization provided by FM 6-150 resulted in better pilots, training and a reduction in accidents. Most importantly it captured proven employment methods as a result of the experience gained in the early stages of the war.

Selection and Training

The next challenge faced by the Department of Air Training was pilot selection and training. Pilots were initially selected from the provision of the War Department memorandum authorizing organic aviation.²² The memorandum stated "Volunteers, now under your control, who are qualified to pilot liaison-type aircraft will be utilized to the maximum as pilots. Additional pilots needed to fill requirements of the 1942 troop basis will be made available by the Commanding General, Army Air Forces."²³ The provision for the selection of pilot applicants initially made no distinction between officer candidates and enlisted candidates

The majority of artillery officers with flight experience were trained under the Civilian Pilot Training Program (CPTP). Classes 1-4 were made up of artillery officers that were CPT graduates.²⁴ The CPTP program began in 1939 to develop a greater sense of air mindedness and enhance growth in civil aviation in the United States. Although not directly tied to the Protective Mobilization Plan, it provided a pool of available pilots

to both the Army and the Navy at the outbreak of World War II. The program was a huge success and by 1 January 1941 the CPTP had trained over 63,000 pilots.²⁵

Per the 1942 War Department memorandum, those seats that went unfilled by qualified Field Artillery officers were then passed to the AAF to fill. The AAF agreed to supply 100 trained pilots to the field artillery a month.²⁶ The initial bulk of pilots produced by the AAF were noncommissioned officers in the grade of staff sergeant. This created an initial problem for the Department of Air Training. The noncommissioned officer pilots being turned out by the AAF program met the qualifications for Officer Candidate School (OCS) and soon after arrival to advanced training departed for OCS.²⁷ The AGF would later direct that all observation pilots would be required to be commissioned officers to alleviate the problem with enlisted pilot observers and reflect the responsibilities associated with the position that extended beyond flying alone.

Another source of pilots was the Air Corps Reserve. The Air Corps Reserve awarded commissions to pilots who completed the CPTP. These individuals received a commission as a liaison pilot in the Air Corps Reserve. When activated these pilots also help fill the initial pilot requirements for the AGF.

The original plan between the AGF and the AAF to produce 120 pilots per month failed because of the limited pool of qualified pilot applicants. To correct this short fall, many of the pilots selected for the glider-training program were diverted to the field artillery. Additionally, as high as sixteen percent of the AAF pilots supplied failed to meet the screening weight or complete the tactical course instructed by the Department of Air Training. The screening weight was necessary because of the limited useful load of the L-4 when carrying two personnel and the SCR 600 series radio. To overcome the

limited useful load of the L-4, the AGF used a screening weight of 170 pounds.²⁸ Some AAF candidates also failed to qualify as observers during Stage C training. Stage C training was the last phase of training and incorporated both flight fundamentals and tactical application.

This initial approach to meeting the pilot allocation outlined in the War Department memorandum led Lieutenant Colonel Wallace W. Ford, Director of the Department of Air Training, to petition the War Department to allow the AGF to select and train pilots.²⁹ Ford was more than qualified to criticize the pilot training problem. An original member of the operational test group selected by General Robert M. Danford, he was directed to establish the Department of Air Training in June 1942. The recommendation that Ford made to the AGF was to send pilot candidates to the CPT program. This "work around" to provide sufficient pilots created a dispute between the AGF and AAF. The AAF would not officially rate the pilots to perform military flying duties, as the civilian outline of instruction did not cover the fundamentals of military flying per the AAF training program.³⁰ This failure to recognize CPTP trained pilots by the AAF created problems with pilot ratings, strength management and pay incentives for the AGF.

An agreement between the AAF and the AGF was reached in November 1942 to establish a source for the primary training of pilots. The agreement required the AAF to initially select, train and send forty pilots a month to Fort Sill for advanced training. The AGF was to provide twenty-five Field Artillery officers per week to the AAF for basic flight training. The responsibility for training directed by the War Department was to be shared by both the AGF and the AAF. The AAF was responsible for nine weeks of

primary flight training and maintenance instruction. The AGF was responsible for advanced flight training and air observer training. The AAF established two schools to conduct primary flight training for organic aviation. The first school was established in Denton, Texas followed by a second school in Pittsburgh, Kansas. After completion of sixty hours of primary flight training with the AAF, students arrived at Fort Sill for seven weeks of advanced training.³¹ The training syllabus covered 200 hours of ground school and additional flight training. The rigors of this training are evident in the twenty four percent wash out rate experienced at Fort Sill.³²

Ground training included selection of suitable landing areas, navigation, meteorology, ground handling, signals communications (airborne and ground) and maintenance.³³ These tasks were taught in the classroom and would later be incorporated into Stage C training. Maintenance for pilots was associated primarily with fueling, engine starting, and protecting the aircraft on the ground from high winds and adverse weather.³⁴

Flight training was broken down into three stages. Stage A required pilots to demonstrate their proficiency utilizing the practical test standards of the CAA. This basically ensured that the pilot received adequate primary training through the AAF or associated civilian contractor. Stage B incorporated operating the aircraft at the operational limits. The training syllabus for Stage B included twenty additional tasks:

Precision ground handling	Barrier takeoffs and landings
Efficiency takeoffs	Slips, forward and side
Crosswind landings and takeoffs	Slipping turns
Power on and power off landings	One-wheel takeoffs and landings

Contour flying and approaches	Strip Dragging (reconnaissance)
Power slips	Fishtails
Simulated and road landings	Starting engine without assistance

The most demanding of these tasks included landing on curved roads, one-wheel takeoff and landings, barrier landings, and contour flying.³⁵ Road landings, although the most difficult to conduct, were rarely done in combat.³⁶ Stage B training was conducted at altitudes below 200 feet above ground level (AGL). Another challenge during Stage B was for the candidate to demonstrate his adeptness at handling the aircraft at minimal controlled airspeed. The requirement called for the pilot to fly the length of the Fort Sill reservation at sixty knots at one foot off the ground.³⁷ Stage C training focused on operational flying and the adjustment of artillery fires. Each candidate had to successfully complete a "Stage Check" prior to moving on to the next phase of training.³⁸

The original plan called for the training of pilot-mechanics. This program was dropped when the agreed upon pilot training program was adopted between the AAF and the AGF. As a result, only thirty-five students qualified in this dual role. The ground training provided in both AAF primary and the AGF advanced instruction provided pilots with sufficient skills to perform and supervise first and second echelon maintenance. Per the War Department memorandum, mechanics would be obtained from sources under the control of the AGF and responsibility for third and fourth echelon maintenance was the responsibility of the AAF.³⁹ Student mechanics that were selected had considerable mechanical experience. Mechanics were trained in repair of airframes and power plants and on completion of training were capable of both first and second echelon maintenance.

The reality became that AGF mechanics in the field performed all maintenance short of a complete overhaul.⁴⁰

Organization

The War Department authorization document for organic aviation for the artillery was based on the experience gained during the test period by the 2d Infantry Division and the 13th Field Artillery Brigade beginning in February 1942. The results of these tests resulted in an authorization of two aircraft per light and medium artillery battalions, two per division artillery headquarters, and two per brigade artillery headquarters. Personnel authorizations were aligned with the aircraft assignment. Personnel were authorized initially at one pilot per aircraft and one mechanic per two airplanes.⁴¹

The artillery battalion's air section normally comprised two L-4 aircraft, truck and trailer, tool kits and communications equipment. The support equipment was allocated on the supported unit's Table of Organization (TO). Personnel included those outlined in the War Department memorandum also included a truck driver and ground helper. The ground helper was later reclassified as a second mechanic.⁴² The second mechanic received on the job training prior to 1944. A provision was also made for the inclusion of an additional mechanic assigned to the air section of the division artillery headquarters to supervise maintenance of the battalion's air sections.⁴³

The senior pilot in the unit was designated the Battalion Artillery Air Officer. He was placed in overall command of the air section and was responsible for continuation training and maintenance. An additional pilot was assigned to the air section of the HHB division artillery in much the same capacity as the additional mechanics. The pilot's responsibilities included both air observation and airplane engineering. As the air

section's engineering officer, he maintained administrative data and technical bulletins provided by the AAF.⁴⁴

The size of an air section was dependent on the supported organization. Infantry divisions maintained the largest complement of aircraft with four artillery battalions and a division artillery headquarters. This allowed infantry divisions to maintain ten aircraft. Armor divisions maintained the fewest number of aircraft until the authorization of a division artillery headquarters for their TO in 1943.⁴⁵ The total number of operational aircraft was generally ten at division level, 50-70 at corps level and 200-300 at the army level.⁴⁶

As the requirements grew to support groups and non-traditional division organizations to include airborne and mountain divisions, the AGF began increasing the allocation of air sections to these units. Justification for air sections emerged also in cavalry squadrons, separate tank battalions, tank destroyer battalions and separate engineer battalions. This increase was to meet the long list of secondary missions that air sections found themselves supporting.

The air sections were slow in reaching the field and did not begin to arrive in strength until mid 1943. There were two problems with filling the required air sections for the divisions. The first of these problems involved training and the second involved acquisition and logistics.⁴⁷ The training aspect would soon rectify itself once the agreed upon training framework between AAF and AGF began producing the established number of pilots. The second issue was that the nation was still ramping up for war production. Although the light aircraft manufacturers were capable of producing the required quantities for both the AAF and the AGF, they competed for the same wartime

resources, as did other industries. These resources included, but were not limited to transportation, raw material and skilled labor.

Infantry Division, Artillery Brigade TO 1942-1945

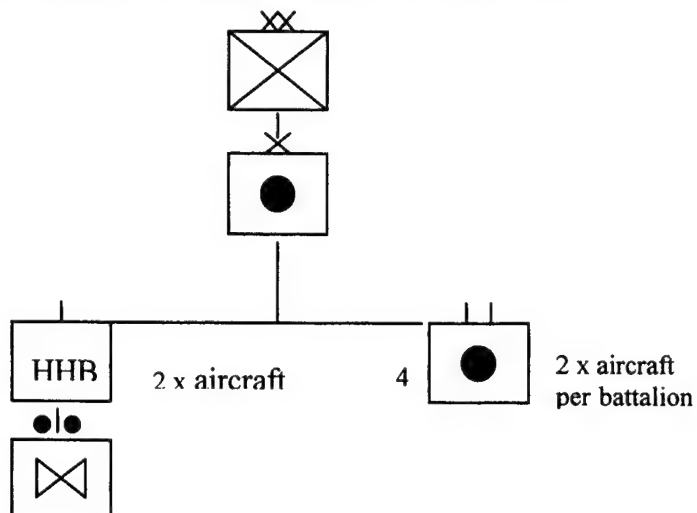


Fig. 4. Infantry Division, Artillery Brigade TO compiled with organic aviation assignment. Source: Howard K, Butler, *Organization of Army Aviation 1942-1953* (St. Louis, MO: US Army Aviation Systems Command, 1987), 26.

Material

An issue that compounded the preexisting problems was parts availability. The War Department directed the AAF to supply necessary repair parts to the AGF, but there was no system in place to conduct "joint" logistics. The ability to provide sufficient parts for the echelon of maintenance authorized by the AAF was slow. This would continue to hamper air operations especially those in more austere environments where the logistics flow was operating at a trickle. It would improve slowly until 1943, when parts production and distribution problems were fixed.

The first of the new generation of observation aircraft in the AAF was the Vultee-Stinson O-49 *Vigilant* (L-1).⁴⁸ This aircraft incorporated many of the STOL characteristics that were found in Germany's Fiesler Fi -156 *Storch*. Though this aircraft seemed the most logical choice for the AGF to pursue, it suffered many shortcomings based on its technological innovations. The aircraft had poor crosswind handling characteristics and weak landing gear. The AGF operated the L-1 only in the CBI in support of the Office of Strategic Services (OSS). The AAF utilized in this theater also where it served primarily as an air ambulance.

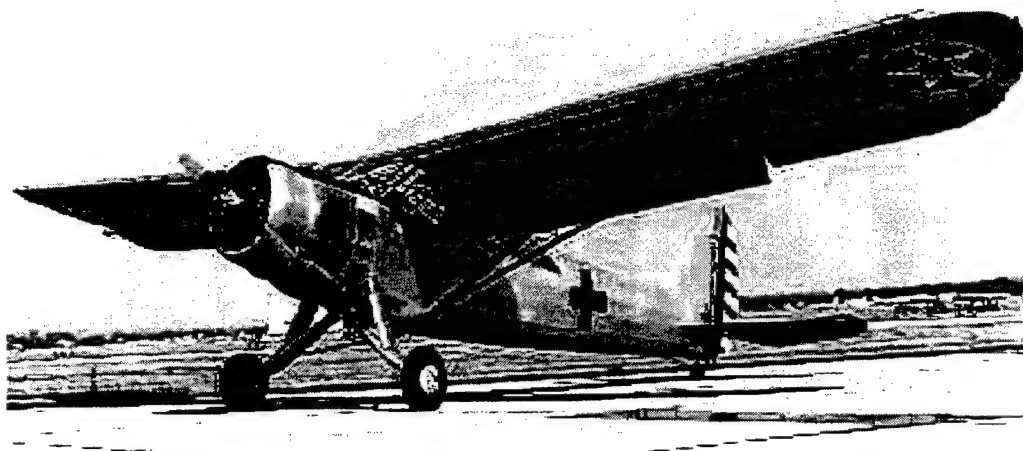


Fig. 5. L-1A Vigilant. Source: United States Air Force Museum.

The AGF recognized the need for these STOL qualities in their own observation aircraft, but understood the demands for developing an aircraft like the *Storch* would be too time consuming. The solution was to incorporate the already available general aviation airplanes then in production. The GHQ maneuvers incorporated a variety of these platforms by Piper, Taylorcraft and Aeronca. On completion of the operational

tests by the 2d Infantry Division and the 13th Field Artillery Brigade, the War Department authorized the procurement of Cub type aircraft.⁴⁹ The name Cub was associated with William Piper's J-3 and used as a general descriptive term for these airplanes.

In 1941 the AGF evaluated three aircraft for use by the field artillery. These three aircraft were the Taylorcraft O-57 (L-2), the Aeronca O-58 (L-3) and the Piper O-59 (L-4).⁵⁰ A series of accidents involving both the L-2 and the L-3 led the AGF to ground the types in the spring of 1943. All three aircraft being equal in performance, the Piper L-4 was the most favored because of its slow flight characteristics. The AGF recommended that the L-4 be the standard aircraft for the field artillery. They went on to recommend that no additional L-2 or L-3 aircraft be procured after the completion of the initial contract. Both the L-2 and the L-3 were retained but reclassified as limited standard or operationally obsolescent.⁵¹



Fig. 6. L-4A Cub. Source: United States Air Force Museum.

Parallel to the procurement of the L-4 as the standard AGF aircraft, the AAF reclassified the L-1 as "undesirable standard" or not for front line use. The Stinson Company already began work on a replacement for the L-1 Vigilant the L-5 Sentinel. The *Sentinel* did not incorporate the STOL technology of the L-1. It was in many respects a larger L-4 with an increased useful load and either a 185 or 190 horsepower engine as opposed to the sixty-five horsepower engine utilized by the L-4.⁵² The AAF as the procurement agent for light aircraft included the L-5 for their use, and limited use by the AGF in the observation, liaison and training role.

The L-5 met with differing opinions in the AGF. The artillery preferred the L-4 to the L-5 for artillery spotting duties because of its good short field characteristics and off field handling. The First Army Field Artillery Air Officer submitted a memorandum that best describes the general consensus to the L-4. The memo stated that the L-4 was preferred over the L-5 for observation work; and that it easily maintained and it handles well on the ground. They thought the L-5 was best suited for reconnaissance and air photo work.⁵³ The L-5's landing gear, similar in layout to the L-4, was less robust and often collapsed on rough fields. As the AGF continued to expand the tasks for organic aviation to perform, it also realized that these tasks exceeded the capability of the L-4. The AGF began using L-5s after the breakout at Anzio in 1944 to supplement their L-4s but not without concerns.⁵⁴ During this time, the AAF wanted to capture organic aviation and incorporate the air sections into the AAF liaison squadrons. The thought was that if the AGF pursued a larger aircraft that this would reinforce General Arnold's argument to remove this capability from the AGF. To prevent undue attention to the L-5, only corps

artillery received them. Although this was the practice in all theaters, many L-5s made it down to divisional artillery units to replace destroyed L-4s.⁵⁵

From initial procurement until the end of the war, the AGF received 5,671 L-4s. The L-4 was delivered in ten models with the "J" and "H" model making up 50 percent of the production. The L-5 production resulted in the delivery of 2,272 aircraft to the AAF, AGF and the Navy. Production of the L-5 would span six models with the majority being L-5Bs.⁵⁶ In 1945 the AGF decided to obtain a replacement for the L-4 and the L-5 that incorporated the characteristics of both airplanes.



Fig. 7. L-5A Sentinel. Source: United States Air Force Museum.

The AGF sought an airplane with built in mounts for artillery radio sets, the payload and range of the L-5 with the STOL traits of the L-1, maximum visibility with a swivel observer seat and armor protection for the crew. The Piper L-14 was selected, but did not arrive until the end of the war. The L-14 also did not meet all of the performance characteristics prescribed by the AGF and was not recommended for procurement by Ford of the Department of Air Training. An observation airplane that met the prescribed

requirements would not arrive in the Army until the Korean War with the introduction of the L-19 (O-1, *Bird Dog*).⁵⁷

Ground equipment authorizations for the air section were modified by each theater, but original TO authorizations called for a 3/4-ton four-by-four truck and 1/4-ton trailer. Mobility for the L-4s when in transit to the area of operation often required ground transportation. To meet this requirement, especially during amphibious operations in the Pacific and for preparation for the invasion of Europe, the air sections began receiving 2 1/2-ton six-by-six trucks. The airplanes wings were disassembled at the main spar and stowed along the side of the truck with the fuselage occupying the bed and the tail braced over the cab of the truck. This enabled rapid mobility for debarkation and movement to suitable areas for build up. Utilizing this technique the L-4s were able to remain close to their supported unit and reduce extended flights. This process with a well-trained crew could take an hour to accomplish. Air sections often employed the assistance of their parent battalion or passing infantry to assist them with loading the aircraft onto trucks.⁵⁸ Many air sections serving with armored divisions were issued M3 halftracks, but the 2 1/2-ton truck was the most preferred vehicle. Almost a common practice for all theaters was the allowance of excess wheeled transportation in the air section. The excess usually took the form of 1/4-ton trucks. These vehicles gave the air section greater mobility to move with the supported unit, conduct aircraft recovery and maintain a radio relay.

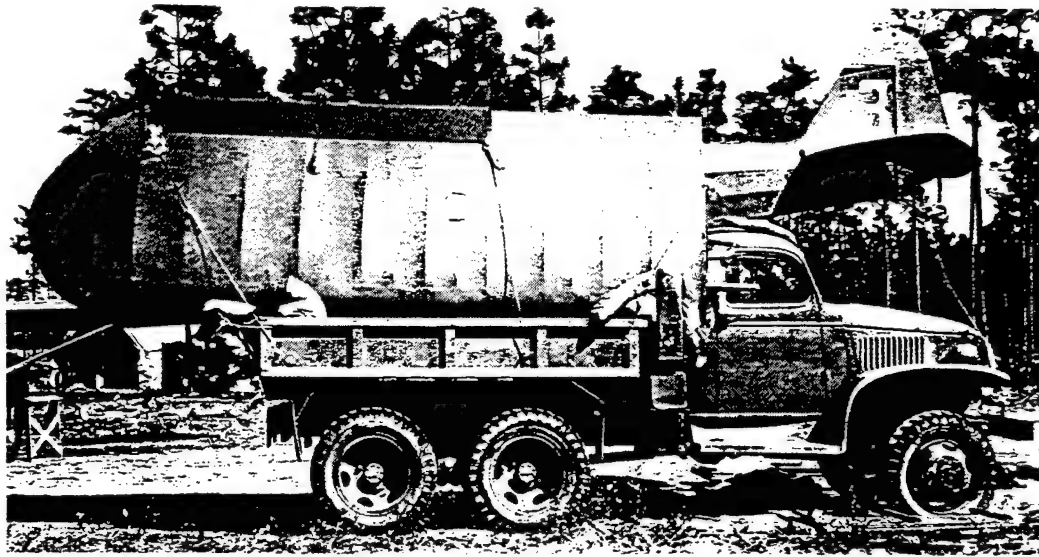


Fig 8. L-4 loaded in a 2 1/2 Ton short bed truck. Source: "Organic Air Observation," *Field Artillery Journal* 32 (July 1942): 501.

Communications was a problem for the air sections throughout the war. The radios utilized were the single channel ground sets. These were adapted for use in the L-4 by modifying the aft cabin area and installing a radio shelf behind the observer's position. The SCR family of radios consumed much of the useful load of the aircraft. This factor also contributed to the pilot weight restriction. Both the SCR 609 and 610 were the common radios employed in the L-4s.⁵⁹ These radios were extremely heavy weighing eighty pounds. Throughout the course of the war efforts were made to replace these with lighter VHF radios.

Air sections began requesting the lighter SCR 615 later in the war when those radios became available.⁶⁰ The L-5s provided by the AAF came equipped with a VHF radio and a rack for the SCR radio set. This enabled the SCR radio to be carried without a weight restriction or the danger of the radio coming free during flight, as was the case in the jury-rigged radio platforms installed in the L-4. Additionally this combination

provided more radio channels for air and ground communications. This capability was important for AAF flights conducting "Horsefly" operations when coordinating close air support for fighter-bombers. It provided the forward air controller with both an air to air channel and an air to ground channel.⁶¹ The issue of radios for liaison aircraft would not be resolved until after the war ended.

Parallel to the development of organic aviation for the AGF was the formation of AAF liaison squadrons. The AAF continued to develop and modify the existing observation squadrons found in the ASC. The AAF decision to reclassify observation aircraft to liaison aircraft followed the reorganization of the ASC after the GHQ maneuvers. These changes were addressed in both FM 31-35 and later with the updated FM 1-5. Observation became a subtask of the liaison squadron. The reconnaissance aspects associated with the prewar organization of observation units was now aligned with the both bomber command and interceptor command of the numbered air force. Reconnaissance aircraft were designed around existing fighter and fighter-bomber designs.⁶²

The AAF originally intended the light planes of the liaison squadrons to provide liaison and courier support to the army and corps headquarters as well as supporting each numbered air force. The squadrons were equipped with thirty-two aircraft and organized into four flights. The demands of combat and the evolution of the capabilities of the light planes serving in both the AGF and the AAF resulted in the expansion of tasks. These tasks developed as a result of needs derived in the theaters. Liaison squadrons were initially trained and equipped to perform air taxi and messenger service for both the AGF

and the AAF. The tasks now included reconnaissance, aerial photography, wire laying, search and rescue, medical evacuation, artillery spotting, and forward air controllers.⁶³

The AAF liaison squadrons were equipped primarily with the L-5 *Sentinel*. They also used L-4s in some theaters and a few L-1s in the China-Burma-India (CBI) Theater of Operations. Squadrons were organized into four flights of eight aircraft. The intent was to assign a squadron to each field army, with an additional squadron serving in a general support capacity to the theater.⁶⁴ The command relationship of the squadron was command less OPCON to the local air commander and OPCON to the supported field army. Because of the nature of the missions they performed, the AAF did not commission the pilots assigned to liaison squadrons. These AAF liaison pilots were noncommissioned officers in the grade of staff sergeant or technical sergeant⁶⁵.

The doctrine utilized by the liaison squadrons for observation and liaison support was found in both FM 31-35 and FM 1-20. The liaison squadrons developed TTPs for employment based on the unique tactical situation of each of the theaters, just like their counterparts in the AGF. The largest contributors in developing TTPs were those liaison squadrons assigned to the China-Burma-India (CBI) Theater. They developed numerous tactics, techniques and procedures utilized by liaison squadrons assigned to the Air Commandos in the CBI.⁶⁶

The Field Artillery School overcame many of the initial obstacles faced in organizing a new unit. The officers of the Department of Air Training developed compromises and solutions that would enable the AGF to build a significant organic capability to provide responsive support to both the supporting artillery commander and the ground commander. The success of this program was anchored in maximizing the

existing resources available. Off-the-shelf technologies and standardization of organizations, material, and training enabled the AGF to quickly develop and implement this capability within the existing force structure. Despite the many challenges in organizing organic aviation and the delay in fielding air sections, the AGF quickly incorporated this combat multiplier on the battlefield. The next set of challenges for the AGF was developing TTPs based on combat experience to sustain the air sections once they were deployed and expanding this capability to other branches of the AGF.

¹United States Army, FM 6-150, *Organic Field Artillery Air Observation* (Washington, DC: Government Printing Office, 30 August 1944), 106-107.

²War Department Memorandum (2-5-42), 6 June 1942, subject: Organic Air Observation for the Field Artillery reproduced in appendix C.

³Michael Lewis, *LTG Ned Almond, USA: A Ground Commander's Conflicting View with Airmen over CAS Doctrine and Employment* (Maxwell AFB, AL: Air University School of Advanced Airpower Studies, 1997), 9.

⁴*Ibid.*

⁵Thomas H. Greer, *The Development of Air Doctrine in the Army Air Arm 1917-1941* (Washington, DC: Government Printing Office, 1985), 40.

⁶US Army, FM 1-5, *Employment of Aviation of the Army* (Washington, DC: Government Printing Office, 15 April 1940), 5-8.

⁷*Ibid.*, 43-47.

⁸US Army, FM31-35, *Aviation in Support of Ground Forces* (Washington, DC: Government Printing Office, 9 April 1942), 3.

⁹US Army, FM 1-20, *Tactics and Techniques of Air Reconnaissance and Observation* (Washington, DC: Government Printing Office, 20 April 1942), 2.

¹⁰US Army, FM 1-5, *Employment of Aviation of the Army*, 51.

¹¹US Army, FM31-35, *Aviation in Support of Ground Forces*, 20-21.

¹²Kent R. Greenfield, *Army Ground Forces and the Air Ground Battle Team Including Organic Light Aviation*, Study No. 35 (Washington, DC: Government Printing Office, 1948), 110.

¹³US Army, FM 1-5, *Employment of Aviation of the Army*, 51

¹⁴*Ibid.*

¹⁵*Ibid.*, 49

¹⁶Richard K. Tierney, "The Army Aviation Story: Part 1," *US Army Aviation Digest* (June 1962): 20.

¹⁷US Army, FM 1-5, *Employment of Aviation of the Army* (Washington, DC: Government Printing Office, 18 January 1943), 45.

¹⁸*Ibid.*, 48.

¹⁹*Ibid.*

²⁰Field Artillery School, *Digest of Conferences of Army Artillery Officers and Corps Artillery Commanders*, (Fort Sill, OK: Field Artillery School 22 March 1944), 24.

²¹US Army, FM 6-150, *Organic Field Artillery Air Observation* (Washington, DC: Government Printing Office, 30 August 1944), 106-107.

²²WDGCT 320.2 (2-5-42), 6 June 1942

²³*Ibid.*

²⁴Alfred W. "Dutch" Shultz interview by author, notes, St. Joseph, Missouri, 8 April 2000

²⁵Devon Francis, Mr. *Piper and His Cubs* (Eagan, MN: Flying Books International, 1996), 72-73.

²⁶Richard K. Tierney, *The Army Aviation Story*, ed. Fred Montgomery (Northport, AL: Colonial Press, 1963), 71.

²⁷*Ibid.*, 75.

²⁸*Ibid.*, 71.

²⁹Richard K. Tierney, "The Army Aviation Story: Part II-Academics and Training," *US Army Aviation Digest* (July 1962): 10.

³⁰Ken G. Wakefield, *The Fighting Grasshoppers: US Liaison Aircraft Operations in Europe 1942-1945* (London: Specialty Press, 1990), 18.

³¹Tierney, "The Army Aviation Story," 14.

³²Wakefield, *The Fighting Grasshoppers*, 19.

³³US Army, FM 6-150, Organic Field Artillery Air Observation, 23.

³⁴*Ibid.*, 13.

³⁵Wakefield, *The Fighting Grasshoppers*, 19.

³⁶Alfred W. "Dutch" Shultz, interview by author, notes, St. Joseph, Missouri, 8 April 2000

³⁷Wakefield, *The Fighting Grasshoppers*, 19.

³⁸*Ibid.*

³⁹WDGCT 320.2 (2-5-42), 6 June 1942

⁴⁰Tierney, *The Army Aviation Story*, 72.

⁴¹WDGCT 320.2 (2-5-42), 6 June 1942

⁴²August C. Kunz, interview by author, notes, Leavenworth, Kansas, 13 February 2000.

⁴³Tierney, "The Army Aviation Story: Part II-Academics and Training," 12.

⁴⁴Wakefield, *The Fighting Grasshoppers*, 19

⁴⁵Howard K. Butler, *Organic Aviation in the Ground Arms, 1941-1947* (Washington, DC: Government Printing Office, 1992), 42-45.

⁴⁶The General Board, United States Forces, European Theater, "Liaison Aircraft with Ground Force Units," (Unpublished study, 1945), 2.

⁴⁷Butler, *Organic Aviation in the Ground Arms*, 3.

⁴⁸On 2 April 42 the AAF changed all O designations to L designations which affected all existing light observation aircraft

⁴⁹WDGCT 320.2 (2-5-42), 6 June 1942

⁵⁰Richard K. Teirney, "The Army Aviation Story: Fixed Wing Aircraft," US Army Aviation Digest (August 1962): 9-11.

⁵¹Ibid.

⁵²John Schroepfer, interview by author, notes, Raytown, Missouri, 12 January 2000.

⁵³Headquarters, Army Ground Forces, 13 February 1945, subject: Report of Observer's in the European Theater of Operations, by Ground Forces Observer's, encl 13, Interviews on Field Artillery Organic Aviation, 3.

⁵⁴Teirney, "The Army Aviation Story: Fixed Wing Aircraft," 13.

⁵⁵Alfred W. Shultz and Kirk Neff, *Janey; A little Plane in a Big War* (Middletown, Connecticut: Southfarm Press, 1998), 157.

⁵⁶[Arthur H. Kesten] *Army Aviation, Cub to Comanche* (Westport, Connecticut: Army Aviation Publications Incorporated, 1992), 7-8.

⁵⁷Al Adcock, *O-1 Bird Dog in Action* (Carrolton, TX: Squadron/Signal Publications, 1988), 4.

⁵⁸Alfred W. "Dutch" Shultz, interview by author, notes, St. Joseph, Missouri, 8 April 2000.

⁵⁹The General Board, United States Forces, European Theater, " Liaison Aircraft with Ground Force Units," 35.

⁶⁰Headquarters, Army Ground Forces, 13 February 1945, subject: Report of Observer's in the European Theater of Operations, by Ground Forces Observer's

⁶¹Shultz, *Janey*, 157.

⁶²Andrew Ten Eyck, *Jeeps in the Sky: The Story of the Light Plane* (New York, Commonwealth Books, 1946), 64.

⁶³Ibid., 85-89

⁶⁴Wakefield, *The Fighting Grasshoppers*, 58.

⁶⁵Alfred W. "Dutch" Shultz, interview by author, notes, St. Joseph, Missouri, 8 April 2000.

⁶⁶Ten Eyck, *Jeeps in the Sky*, 84.

CHAPTER 4

MISSIONS AND EMPLOYMENT

The bird hovers over our positions and if we make the slightest move- all hell breaks loose.¹

German Prisoner describing the impact of the L-4

The purpose for acquiring light aviation for the AGF was to provide the Field Artillery with aerial observation platforms or Air OPs. Once placed in service the merits of light airplanes to conduct other aerial support missions was quickly realized by the field commanders. The use of the air section's aircraft in conducting other than observation grew to a point that artillery mission support fell below twenty percent during operations in North Africa.² The missions that air sections were responsible for performing grew throughout the war. By August of 1945, the requests for light aviation were expanded with the approval of the AAF to include air sections in maneuver units to limit the diversion of field artillery air sections.³

There was no standardized method for developing the new tasks being requested by the ground commanders. The tasks conditions and standards for performing these new missions were developed in theater by the air sections within the corps and divisions. Each theater developed performance measures that would eventually be standardized throughout the force by means of the Department of Air Training at Fort Sill. The Department of Air Training took the tasks and included them into the advance training program and the doctrine.

Missions for artillery aviation were not formalized until the release of FM 6-150, *Organic Field Artillery Air Observation*, in August of 1944. Prior to its release units in each theater developed tactics techniques and procedures (TTPs) specific for both the

flying environment and tailored to the needs of the respective theaters. The corps artillery air officer standardized the TTPs for the subordinate units. The majority of the TTPs developed were derived from combat experience and operational requirements. The tasks developed to support these requirements and the associated training plans to indoctrinate newly arrived pilots would not become standard until the release of FM 6-150.

The typical mission profiles for artillery organic aviation prior to FM 6-150 were to conduct aerial adjustment of artillery and naval gunfire, perform limited liaison duties, provide radio relay, and conduct limited reconnaissance. As the war progressed, expanded roles for artillery aviation extended to include aerial resupply, medical evacuation, flak suppression, aerial dispersal of communications wire and perform as forward air controllers.

The AAF struggled to identify the roles and functions of liaison squadrons. The AAF wanted to perform the missions identified by the AGF and even fought to gain control of the air sections of the field artillery. However, they were not embraced by the AGF in their plan. The AAF failed to provide the AGF with sufficient squadrons to support the AGF requests and those few squadrons that were deployed were not in proximity to the ground commander to be responsive. Despite this discord between the AGF and the AAF, the liaison squadrons carved out a unique niche in each theater that proved valuable. They were particularly effective in operations in the CBI Theater where there were no artillery air sections assigned.

Missions

After their introduction into combat in all theaters of operations, the air sections began to increase the effectiveness of artillery and naval gunfire by employing new fire direction techniques that had been developed between the wars. Artillery L-4s soon earned the respect of the common "Dogface," "Redlegs," and most importantly the enemy for their ability to quickly acquire, call for and adjust fires onto targets. So valuable were the air sections to the field artillery battalions that it was common practice to saturate any enemy position relentlessly that fired on an L-4.⁴

The German Army like the British Army had been one of the first to exercise the light plane in this role, but did not come close in matching the capabilities of the artillery air section. The Germans were indignant about the little L-4s. Many captured German soldiers articulated that when they were hovering above their positions it was impossible to move or fire without them locating their positions and bringing large volumes of fire on top of them.⁵

Air sections also became a critical link in the counter battery mission. From their lofty perch above the battlefield they were quick to locate the tell tale signs of enemy artillery. The pilots looked for muzzle flashes, smoke or poorly concealed batteries. It became common practice for pilots to look for these indicators on any mission, as the dividends yielded from destroying enemy artillery were exponential compared with the risks of maintaining L-4s in the air.⁶ The best time to catch enemy artillery was during end of evening nautical twilight (EENT) and beginning of morning nautical twilight (BMNT). Commanders were eager to plan night operations for the air sections to maximize aerial patrols. The air sections were only able to conduct limited night

operations because of the operational and environmental flying demands that could not be realistically overcome.⁷

Flak suppression was another type of mission that developed during operations on the Italian peninsula. The targets in this mission were enemy antiaircraft weapons. The L-4s would follow the bomber stream as they flew over the divisional areas and look for flak batteries that began engaging the bombers. Once identified, the pilots would utilize the same counter fire procedures to suppress the flak batteries. The major benefactors were usually medium bombers attacking ground targets in support of Allied advances.

Command and control was the most utilized secondary mission performed by the air sections. Since the introduction of the light plane during the GHQ maneuvers, commanders at all levels were impressed with the light plane to enhance command and control. This task encompassed several areas. These areas included providing courier support, VIP transport, radio relay, message drop and pickup, and aerial wire dispersment.⁸

Aerial wire laying was a field expedient developed to quickly establish wire communication and allow wire to be laid over difficult terrain. The L-4s were fitted with a bracket that enabled spools of communication wire to be deployed from the wing strut. A wind sock was attached to the wire and once the pilot was over the area that the wire was to be deployed, he released a brake from the cockpit which allowed the wire to be unreeled. This method was improved upon and a larger system was developed. The modified system was much heavier and required the use of the L-5. A canister was mounted to the wing strut, which enabled two miles of wire to be carried as opposed to the 1/2 mile carried by the L-4 system.⁹

Reconnaissance was an important task of the air section. Whether performing this as a specified or implied task, the air sections provided valuable near real time intelligence to both the commanders and the intelligence sections. Air sections began being used in a reconnaissance role in North Africa. The intent of these missions in North Africa was to distinguish mechanized formations as either friend or foe. The dust created by large armored and mechanized formations in the desert made it nearly impossible to distinguish friendly and enemy formations until they arrived within the range of their weapon systems. This sometimes led to incidents of fratricide. The air sections reduced this risk by physically confirming the identity of a unit. The reconnaissance task became important enough for army and corps artillery commanders to begin requesting an organic observation squadron to support the corps in conducting reconnaissance in early 1945.¹⁰ As the war progressed in all theaters, light planes became vital in providing this timely intelligence to commanders. The ability of both AAF liaison squadrons and artillery air sections to peer out ahead of advancing columns and determine the enemy disposition allowed the advancing units to avoid enemy ambushes, bypass restricted terrain, and identify enemy counterattacks. Air sections took great pride in "Riding the Spearhead" as the mission came to be known.¹¹

Another area in reconnaissance that light planes excelled was in air photoreconnaissance. Problems in air ground cooperation due to doctrinal conflicts and service priorities created significant problems for the AGF. One of these areas was in obtaining air photos to assist in planning. The AAF photoreconnaissance units (PRU) priority of mission support went to pre and post strike reconnaissance. The availability of PRUs to support the AGF left a void in the ability of the AAF to provide tactical

reconnaissance for ground operations.¹² Even when this capability was made available to the AGF, the platforms used were a combination of armed and unarmed fighter and medium bomber variants.

These aircraft made excellent photoreconnaissance platforms for supporting the AAF, but could not provide the necessary detailed photos required by the AGF. PRU pilots found it difficult flying at speeds in excess of 300 miles per hour to pick out the aspects of both the terrain and the enemy that was necessary to obtain for the AGF's usage. Artillery air sections on the other hand could fly low and slow enough to pick out these target aspects that were already familiar to them. In 1943, although reluctantly, the AAF provided some K-20 cameras to the AGF that were able to take oblique photos. The quality of products produced by these photoreconnaissance missions were much better than those provided by the PRUs.

The use of light planes to perform medical evacuation was not a new concept to the military at the outbreak of World War II. The USMC was the first to exploit the capabilities of the airplane beyond the defined roles developed during World War I. The Marines utilized airplanes to scout, perform aerial observation, provide close air support, perform resupply and conduct medical evacuation during the "Banana Wars."¹³ This previous experience led the Department of the Navy to order light planes for both the Navy and the USMC to be utilized in this role as well as the roles defined for field artillery light planes.¹⁴

The most extensive use of light planes in the evacuation role was in the Pacific. Here primarily AAF liaison squadrons used light planes to evacuate wounded and drop medical supplies to isolated units. Within the AAFs in the Pacific the "Air Commandos"

made some of the most daring medical evacuations of the war. Initially utilizing L-1s, they developed a host of improvised methods for plucking injured soldiers and airmen from remote jungle landing strips or from behind Japanese lines.

Artillery air sections would not incorporate this as a standard mission, but often air sections or individual pilots would answer calls of mercy to the best of their capabilities. Most noteworthy of these actions was the emergency resupply of medical supplies to the 101st Airborne Division during the Battle of the Bulge. The besieged Bastogne garrison radioed that it was in imminent danger of having many of its 500-wounded die from wounds if medical supplies were not made available. On Christmas Eve, LT Schley of the 28th Infantry Division Air Section volunteered to fly the much needed medical supplies to the garrison. Facing both hazardous weather and enemy fire he reached the 101st with his precious cargo of medical supplies.¹⁵ On more than on occasion, flying flak suppression missions, artillery pilots observed the crash of an Allied bomber or fighter behind enemy lines. It was often the pilot on the scene that would dash in to recover the survivors.¹⁶

Aerial resupply, like medical evacuation, was another valuable mission that light planes performed. In all theaters both liaison squadrons and artillery air sections provided support to this mission with great success. Units from battalion level to rifle squads were resupplied from the air or by way of expedient airstrips in a pinch. These missions demanded creative planning and innovation. Many of the lessons learned from these operations would be incorporated into the developing TTPs.

Evolving AAF Doctrine and Forward Air Controllers

The AAF developed FM 100-20, *Command and Employment of Airpower*, in July 1943. This was an AAF response to correct problems encountered in North Africa in command and control, apportionment. The manual provided centralized command and control of AAF organizations under a single airman and changed the priorities of airpower. These new priorities became air superiority, interdiction and close air support. The aspect of cooperation as it related to the AAF supporting ground maneuver was lacking. The AGF still struggled with generating timely and sufficient support from the AAF until after the D-Day landings. This new doctrine only reinforced the need for organic aviation in the AGF. The AAF, by limiting the support to air ground operations; also strengthened the AGF plans to expand organic aviation to other branches.¹⁷

The use of tactical air support to assist ground maneuver was developed by the AGF. Initially developed by the Fifth Army and XII Air Support Command during the campaign in North Africa, the "Rover Control" concept was developed to promote close tactical support.¹⁸ This concept better known as Rover Joe was to allow pilots to talk through the prohibition imposed by the theater air command in providing close air support to the ground commander.

Under the scope of FM 100-20, theater air commands tightened control measures on units supporting ground operations. This limitation severely restricted ad hoc cooperation that was used in close air support. The success of the "Rover Joe" program in North Africa prompted Fifth Army to expand the concept in Italy. The new concept was to place air officers in L-5s to control fighter-bombers in the path of advancing ground troops. Although not a complete success, the program continued to expand and

became better known as "Horsefly."¹⁹ Horsefly would prove very useful after the Allied invasion of Europe.

North African and Mediterranean Theaters of Operations

Operation Torch provided the baptism of fire for organic aviation. Flying from the USS *Ranger*, three L-4s assigned to the 3rd Infantry Division launched on 9 November 1942 to provide observation support. The launch was uneventful, but the ingress to the designated racetrack at *Fedala* where the L-4s would refuel and continue on to adjust artillery and naval gunfire proved almost disastrous. Ships in the invasion convoy and soldiers of the 2d Armored Division, who had previously landed, fired on the Cubs as they flew the sixty miles from *Ranger* to the racetrack. This embarrassing and almost deadly case of fratricide was due to poor coordination and a desire to maintain radio silence by the Navy.²⁰

Captain Ford E. Alcorn led the flight from *Ranger* that day and was the only one not to make it through the melee of friendly fire that greeted them. After being hit, he put his shattered L-4 down and managed to walk away from the wreckage. He was struck by enemy ground fire from a Vichy French position and was wounded in the leg. He was captured by the Vichy, but was soon repatriated and escorted by civilians to an aid station where he was treated for his wounds.²¹ Although Alcorn failed to complete his mission, his accomplishments were many. He was the first AGF aviator to take off from a carrier and fly in combat, the first to be shot down and the first to be wounded.²² As a result of this first day's action, the 3rd Infantry Division was now down to two aircraft with no immediate replacements.

The remaining artillery aircraft assigned to the 3rd Infantry Division would not come ashore until December. Pilots and crews disembarked in the port of Casablanca only to find that there were no aircraft awaiting them. The AAF was in the process of shipping the crated L-4s to the theater. The abundance of pilots with no aircraft led to another problem of being in compliance with AAF regulations on pilot currency. As a result, Captain Devol, the 3rd Division Artillery Air Officer, managed to organize air section pilots to rotate through the remaining aircraft. The aircraft eventually began to trickle in and were assembled, tested and dispersed to their assigned battalions²³.

During the buildup for operations against the Axis forces in Tunisia, the air sections spent the vast majority of their time flying secondary support missions. These usually took the form of courier and air taxi services flying high-ranking officers to meetings, conducting aerial inspections of unit camouflage and making flights to the rear for parts to repair aircraft damaged in training flights.²⁴

Because initially not all of the assigned divisions were heavily engaged in combat operations in the theater, a number of pilots were attached to the Royal Air Force's No. 651 Squadron. The 651 Squadron were flying Taylorcraft *Austers* in support of the British 5th Corps in Tunisia. This exchange proved to be extremely valuable to both the AGF and the Field Artillery School. The lessons learned in combat by these exchange officers were quickly disseminated and incorporated into the Department of Air Training's syllabus.²⁵

Air Sections began flying in earnest after January 1943. Although many of the missions were conducted to provide reconnaissance on the disposition of forces in an effort to prevent fratricide, experience in adjusting artillery fires was also refined.²⁶ The

effects of aerial artillery adjustment against the enemy were demonstrated in March 1943 when the 10th Panzer Division launched a major thrust against US positions. Two L-4s circling above the column directed a withering artillery barrage that helped to stop the assault.²⁷ The value of the artillery aviation was proven during operations in the North African Theater of Operations. Field commanders ensured the continued success of artillery aviation due to the first hand experience gained in using these aircraft to assist them in seeing the tactical picture of the battlefield

Operations in North Africa identified that organic aviation in the field artillery had merit. After overcoming problems in command and control and tactical employment, the division air sections yielded impressive results. Despite these successes, the AAF was eager to eliminate organic aviation from the AGF. The AAF argued that organic light aviation did everything but provide support to the field artillery. The AAF showed that the majority of missions flown were not in support of artillery spotting. The numbers from the theater supported the AAF claim. The result was that of the 715 missions flown from 23 April to 8 May 1943 only 13 percent were in support of artillery spotting. Fifty-five percent of missions flown were in support of liaison and reconnaissance requirements.²⁸ However, this argument would not be supported by the War Department as the AAF had yet to establish one liaison squadron to support the AGF by 1943. Additionally, the ASC provided few sorties in support of the AGF in North Africa.²⁹

Although few missions were flown in support of the artillery, the result of operations in North Africa served to reinforce the capability of organic aviation.³⁰ The lessons learned in this theater also served to illustrate the lack of a sufficient doctrinal

framework by the AAF to support AGF requirements. This lack of support proved to quell the continued AAF opposition to organic aviation within the AGF.³¹

The air sections also proved that they were not as vulnerable as had previously been thought. It was originally believed that the artillery flights would be no more than seven minutes in duration. It was thought that seven minutes would be the maximum amount of time that the L-4 would need to fly out, make the necessary adjustments and return before the enemy could force them down. This was not the case once the air sections entered combat. Experience in Tunisia proved that they could remain in the air until their fuel was exhausted. The reasons behind this were the L-4's low-level maneuverability, the achievement of air superiority by the Allies, and the close coordination of artillery flights with antiaircraft batteries and units performing small arms fire air defense.³²

The Mediterranean Theater of Operations involving the invasion of Sicily and Italy would be the real test of organic aviation in a much more deadly setting that took the form of both the enemy and the environment. This theater also served to put aside any doubt by both artillery and maneuver commanders as to the usefulness of these aircraft employed in their primary role of adjusting artillery as air observation posts.

Necessity is the mother of invention and this held true for the air sections in this theater. During Operation Husky, the initial amphibious assaults were supported by L-4s that flew from a modified Landing Ship Tank (LST). These "baby aircraft carriers" were modified to carry eight L-4s. Although they could launch the L-4s from the runway built atop the LST deck, the aircraft could not be recovered. The runway was constructed of steel planking and was two hundred and ten feet long and twelve feet wide. This enabled

the artillery to have a least eight airplanes available during the initial assault phase of the landings with the remaining aircraft of the air sections coming ashore across the beach either in crates or partially disassembled in trucks to link up with their respective battalions.³³

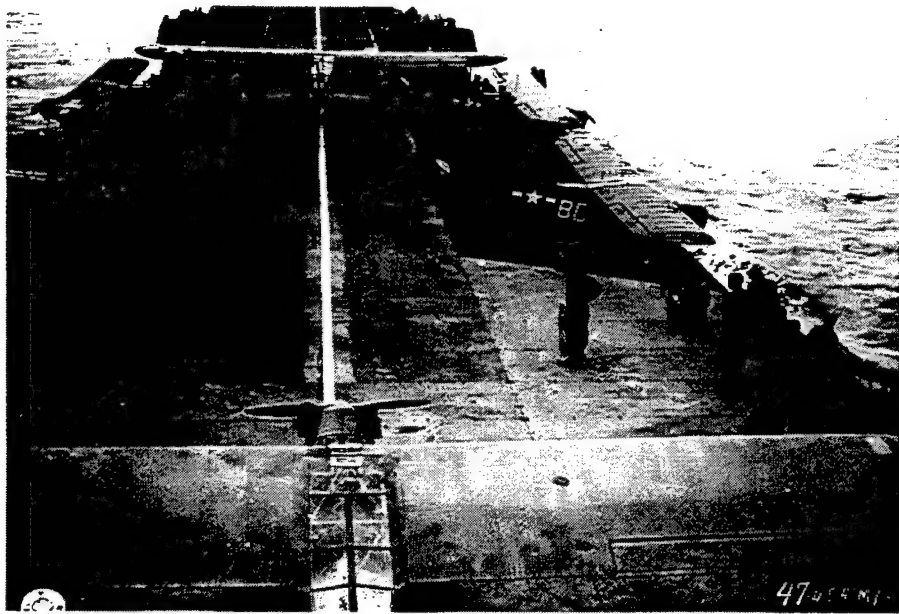


Fig. 9. Picture of converted LST flight deck. Source: Bernard C. Borning, "Artillery on Offshore Islands," *Field Artillery Journal* 36 (February 1946): 91.

The artillery aircraft carriers were a huge success and would be used again in later operations. Flying from the makeshift runway, planes were soon over the beaches adjusting naval gunfire with deadly accuracy. Follow on air sections landed in LSTs and crossed the beaches to assembly points where they were unloaded from the back of their 2 1/2-ton long-wheelbase trucks and quickly had their wings mounted.³⁴ These aircraft

relieved the sea-launched aircraft that had been launched in intervals to maintain station over the beaches and direct fire.³⁵

These techniques ensured the air sections responsiveness to the landing force. It was also in Sicily that the air OP began developing techniques to assist in the counterbattery fight. A 155-millimeter battery (Long Tom) received counter battery fire from a German emplacement believed to contain 240-centimeter guns. No observers were able to locate the German firing position in the rugged terrain. The DIVARTY commander sent out an L-4 to locate the target. Lieutenant E. R. Smartt responded and quickly located the German firing position. He relayed the coordinates and adjusted the battery with three volleys onto the target to fire for effect. The position was silenced and the Allied artillerymen were able to return to supporting the advancing infantry.³⁶

Beside the ever-present threat of enemy antiaircraft fire and roving fighters, the air sections also faced new and hazardous environmental factors. These environmental factors included flying at high-density altitude, mountain flying which entailed air currents, mountain waves, turbulence, and slope landings. The most dangerous environmental condition faced in North Africa had been coastal fog and the occasional crossing of the Atlas Mountains. The environmental hazards faced in Sicily were quick to claim an unwary L-4 and its pilot. The majority of these victims fell to landing accidents on slopes and rocky fields.

Another concern for the air sections was that in flying in the rugged mountainous terrain they had to climb to an altitude between 1,000 and 2,000 feet to gain a reliable position to conduct observation. This increased their exposure to enemy ground fire and also to enemy fighters. To remedy this situation the pilots, when possible, would fly out

and parallel the coast to look up into the valleys for enemy activity. To avoid encounters with enemy fighters the pilots flew in pairs, one aircraft dedicated to looking for targets and the other watching for signs of enemy fighters. This tactic, although consuming two aircraft, ensured that no air sections lost any aircraft to enemy fighters during the Sicilian Campaign.³⁷

The effects of this light airplane did not go unnoticed by the German command. Enemy radio intercepts indicated that the L-4s became the number one priority of fighters seeking targets of opportunity. German fighter pilots received twice as many points toward an air medal for downing an L-4 than they did for an enemy fighter. Soldiers received a 15-day pass if they knocked down an observation plane. Later during the Italian campaign it was not uncommon for German *Jagdstaffels* (fighter squadrons) to organize "Cub hunting" missions.³⁸ The results of these encounters were not one-sided affairs. Many German fighter pilots were killed trying to pursue L-4s at low altitude. The L-4s superior maneuverability and slow flight enabled them to turn on a dime. The pursuing fighter trying to maintain position often stalled or flew into the terrain while trying to bring fire onto the L-4. If the pilot of the L-4 could not out maneuver his opponent or there were multiple fighters pursuing him, he often drew the fighters over friendly lines where a hail of antiaircraft fire would await his pursuers or if the terrain and time allowed he would just land his plane and hide in a tree line or small town. These tactics proved effective, but despite their best measures many L-4s fell to both fighters and enemy antiaircraft ambushes.

Another product of the air sections ingenuity in problem solving during later engagements on the island came in the form of conducting emergency resupply of

isolated infantry units in the rugged Sicilian terrain. An air section utilizing blankets as parachutes and carrying water, ammunition and food dropped resupply bundles to beleaguered infantry isolated on a mountain. The L-4 flying beyond maximum gross weight flew over the riflemen and the observer pitched out the supplies. Mounting releasing racks for light fragmentary bombs to carry supply bundles made from discarded 105-millimeter shell containers and using blanket parachutes would refine this technique.³⁹

Sicily set the foundation for air section employment for the invasion of Italy. Air sections directed over 90 percent of the observed fires during this campaign. Commanders now fully understood the air section's effectiveness in bringing fire rapidly to bear on enemy positions. They also appreciated the myriad of other tasks these light planes could perform in supporting tactical operations and set about to ensure that future operations on the Italian mainland would fully incorporate this capability.

The air sections began the Italian Campaign with Operation Shingle. The first phase of the campaign was the landings at Anzio. From the onset of the assault phase the air sections were involved once again utilizing the proven LST carrier concept. The launches from the LST were more difficult than they had been during Sicily. Low winds over the deck made takeoffs risky and as a result caused the loss of a plane.⁴⁰

During the Fifth Army breakout out of the beachhead, air sections were instrumental in identifying German reinforcements and directing both artillery and naval gunfire onto these targets. Air sections utilizing three cruisers, the USS *Brooklyn*, the HMS *Dido* and the HMS *Orion* and 370 guns of various calibers pounded targets that

provided a breach for the Fifth Army breakout and prevented the Germans from massing any significant counterattack.

Innovations for the employment of the air sections continued to abound and Italy was no different than any of the other theaters. Air sections earned their sea legs when they flew courier and VIP transport missions from the Naples area on their float equipped L-4s to the Anzio beachhead.⁴¹ These missions were flown over a two-month period until the final breakout. These missions were critical in supporting the command and control functions of the Fifth Army.

Once inland, the air sections in the advancing divisions would set new records for the number of missions fired on the advance to Cisterna. The 3rd Division Artillery had several battalions that fired in excess of 10,000 rounds a day with support from their air sections.⁴² The German batteries of 170-centimeter howitzers, and *Nebelwerfer* rocket launchers were inflicting the heaviest casualties and proved elusive to aerial bombardment.

The best weapons available to reduce the German artillery threat were the Allies' own long-range artillery. Faced with the same rugged terrain experienced in Sicily, the best instrument to adjust these pieces were once again the air sections who could rapidly observe large areas for the tell tale signs of enemy artillery. Once the enemy positions were identified, usually by observing flash or smoke, the counter fire would be adjusted onto the target. The counter battery standard operating procedures developed in the 3rd Division called for all of the guns in the DIVARTY to rapidly mass on German artillery batteries once spotted by an air OP.⁴³

Both medium and heavy bombers attacked targets in support of the ground advance, but they lacked the precision necessary to destroy the targets. The bombers were capable of only one strike per sortie. Once the bombers released their payload there was no means available to refine the attack or reattack the target immediately.⁴⁴ In the first two days of the attack on Monte Cassino, artillery units delivered 11,000 tons of ordnance. This was the equivalent of 1,100 heavy bomber missions. The value of artillery to the AGF is that one 8-inch gun delivered more firepower per hour than three heavy bombers with much greater accuracy.⁴⁵ The air OP contributed to this accuracy by reducing the number of rounds required to bring effects onto the targets.

As the campaign continued in the drive to Rome during the Vulturno offensive weather began to hamper the AAF PRU. The entire Fifth Army, massed for the final assault to the city, was immobilized for days. General Lucian Truscott, the commander of the Fifth Army, sent an L-4 up the Apennine River valley to conduct a low-level photoreconnaissance mission. The L-4 flew the length of the valley under the low-overcast snapping pictures from a K-20 camera. The Cub returned without incident with its valuable intelligence and soon after the assault began.⁴⁶

Although this incident was due to weather, the AGF was not happy with the results of requested reconnaissance support. Since the commencement of operations in North Africa the AGF was plagued with minimal or no reconnaissance support. The priorities of AAF photoreconnaissance missions were for gathering strike data for bomber missions. In an effort to solve this problem the air sections began being equipped either directly or indirectly with cameras to conduct air photoreconnaissance. This was only a Band-Aid to a larger problem that could not be resolved by having air sections fly

over the battlefield and snap pictures. It also required training G2 personnel and developing air photo interpreters within the intelligence sections. These issues would not be resolved until a mutually agreed framework for air ground cooperation and training could be instituted. Both the AGF and the AAF would not commit to this area in earnest until the later half of 1944.⁴⁷

It is estimated that over three quarters of the missions flown in Italy were reconnaissance type missions. Air OPs located forward elements, watched for counterattacks, reported road conditions and status of bridges, and took oblique air photographs to supplement PRU missions.⁴⁸ It was also during this campaign that air sections began supporting bomber strikes by flying flak suppression missions. This technique was especially valuable to medium bombers flying at lower altitudes.

The experience from the Italian campaign with the expanded task list would be incorporated and standardized into the air sections SOPs. These expanding SOPs would serve as the doctrinal framework until the Department of Air Training finalized FM 6-150. The majority of missions flown by air sections were by doctrine those to be performed by AAF liaison squadrons. The number of squadrons available to the ASCs was not sufficient to perform all the AGF requested tasks. The lack of these units forced the Fifth Army to expand the role of their organic aviation to meet these demands. The Fifth Army understood the added value of secondary missions performed by the air sections, but also knew that it distracted from their primary function and made every effort to reduce these types of missions.

This issue also renewed interest in the AGF to incorporate additional organic aviation into other branches and also generate the requirement for the AAF to expedite

fielding liaison squadrons to perform these tasks. Operations in North Africa, Sicily, and Italy would provide a framework for further employment of light planes during the invasion of France.

European Theater of Operations

Soon after arriving in Great Britain in 1943, air sections began preparing for the Allied invasion of Normandy and Southern France by implementing a robust training program. The program incorporated individual flying skill and tactical task training. The division and corps air officers utilized the experience of veteran pilots and the new TTPs developed to support the evolving task list. The training also encompassed the missions to support specialized operations. These operations included amphibious assaults, airborne operations, night flying and the use of ski equipped L-4s.⁴⁹ Air section training would continue right up until the start of the invasion.

The invasion of Normandy was the largest amphibious assault in the ETO. The primary challenge for planners was in getting air sections to the beach to support the assault force. Limited transport space available for the amphibious assaults and the prioritization of assets caused planners to develop three methods of getting the air sections into the fight. These methods were employed for both the invasion of Normandy and Southern France. The first method was to disassemble aircraft and load them onto 6x6 long bed trucks and load them onto LSTs. This technique had been utilized before and worked well provided there was sufficient room to rebuild and operate the aircraft within the confines of the restricted beachhead. The second method was the employment by an LST aircraft carrier. Again another proven method used in Sicily. The third method used was ferry flights. These three methods were used in both amphibious

assaults made in France. The ferry flight was made possible by the use of an eight-gallon fuel cell made from a discarded oxygen bottle to increase the range of the L-4.⁵⁰ Of these three methods, the LST carrier provided the best means of moving the air sections with the supported units. By utilizing a combination of these techniques, air sections were employed from the initial assault. Follow on air sections arriving by air or over-land quickly replaced L-4s launched from the LSTs. This plan would enable the artillery to maintain an air umbrella for indirect fire support over the invasion forces.⁵¹

Utilizing an LST, the first air sections over Normandy were from VI Corps. They began supporting operations at H+1.⁵² Subsequent air sections were off loaded over the shore or made the ferry flight across the Channel utilizing internal fuel cells. Air sections had difficulty in providing sufficient air patrols over the beachhead. It would not be until D+2 that sufficient aircraft arrived at the beachhead. Those aircraft in the assault waves did not fair well. Many of them were destroyed by German ground fire before they could be put into operational condition. . The 1st Infantry Division was one of the first units to put an air OP over the beach on D+1. After the beachhead was secured, an armada of L-4s took off across the channel to join their battalions forward.⁵³

The L-4s were key to the subsequent breakout operations. The fighting in the *bocage* or hedgerows during the breakout was extremely costly to the Allies in terms of casualties. This dense system of boxed in fields made for slow progress as each square had to be cleared of entrenched enemy. Armor was of little use because of its vulnerability to anti tank weapons from concealed positions. Artillery was the best way to maneuver against these enemy strong points. However, the lack of dominant terrain limited terrestrial observation by ground observers. The only source of long range

observation was the artillery air sections. Flying directly over the squares, the L-4s were able to suppress the enemy fortifications with accurate fires enabling Allied units to maneuver against these strong points.⁵⁴ L-4s also provided reconnaissance and guided ground attack aircraft against these enemy positions during the fighting in the *bocage* country.

By the end of June the First Army had 261 aircraft and 289 pilots in France. From D-Day until the end of the month the air sections flew more than 4,960 hours. During this same time period thirty-six aircraft were lost and twenty pilots were killed. Of the losses almost fifty percent were attributable to accidents that were pilot induced.⁵⁵ In July the First Army doubled its flying hours, but was faced with a problem that had accounted for the loss of two L-4s. Friendly mortar and artillery fires claimed two L-4s and crews. The First Army adopted changes in operating procedures to mitigate these risks.

The landings in Southern France were met with much less resistance. The methods utilized to move the air sections in the invasion of Normandy in June 1944 were used in Operation Anvil in August 1944. Only a few ferry flights were used to support this operation because of the distance from the airfields in Italy. LST 906 was used as the carrier during this operation with the additional air section aircraft being delivered over the shore. Operation Anvil did not meet the same resistance as Overlord. The Seventh Army quickly advanced inland without significant resistance. The air sections were quickly assembled on the beach and used to screen forward of the advance inland. General Patch, commander, Seventh Army, was concerned that the Germans had prepared a defense in depth further inland and was leery of being surprised. Here the

division and corps air sections were primarily utilized in a reconnaissance role to identify ambushes and possible counterattacks.

Once the Allied forces had broken out across France and were driving toward Germany the rapid pace of the advance went unchecked by the Germans until December 1944. During this rapid advance the air sections were employed to identify concealed German position and laagers, conduct reconnaissance in front of armored columns, and transport commanders from their headquarters to the lead elements of the advancing units. Air OPs conducted dawn to dusk patrols in the parent battalion sector. These patrols prevented the enemy from conducting offensive operations and employing indirect fires. The counter-battery response provided by the air OP nearly eliminated the threat of enemy artillery.⁵⁶

The air sections also assisted in maintaining the logistics line. To support the rapid advance the Transportation Corps Army developed the "Red Ball Express." The Red Ball Express was a convoy system to expedite the resupply of forward units. L-4s were used to protect and monitor this endless line of supply trucks. They dispatched repair teams to broken down vehicles, reported accidents, and were always ready to direct fires to protect the convoys as they entered the main battle area. This command and control support enhanced the efficiency of the Red Ball Express.⁵⁷

The air sections developed special techniques use in Europe to overcome environmental limitations. Night flying techniques were developed to provide 24 hour observation by the air section. Night flights did not warrant the limited gains made in aerial observation based on the associated risk. Problems with coordination, navigation, and weather restricted the widespread use of this technique. Although a number of units

employed night aerial observation, the armies operating in Europe did not endorse night combat operations by air sections because of the limitations of both the equipment and the crews.⁵⁸

Winter operations posed a significant hazard to flying in Europe especially during the winter of 1944-1945 one of the coldest on record. Low ceilings, icing conditions, extreme cold weather, and landing surfaces provided a number of challenges to both aircrews and mechanics. The extreme cold weather necessitated that engine oil be drained from the case in the evening and pre heated prior the first launch of the day.⁵⁹ Condensation would build inside the fuel tank and would freeze in the fuel lines or in the carburetor causing an engine to quit during takeoff. Frost was another lethal environmental hazard. The accumulation of heavy frost on the wings surface would disrupt air flow over the wing. Enough accumulated frost would cause the flow to become so disturbed that air would burble (separate from the air foil) and cause the wing to stall (lose lift).

Air sections began a series of preventive measures to deal with these conditions. SOPs reflected requirements for preheating aircraft, sweeping or covering wings and straining fuel. Although the L-4 was capable of operating on skis, only a few sets were available in the First Army. Other units packed strips down by hand or drove vehicles across the surface to provide a hard landing area.⁶⁰

Other interesting uses of the L-4 in the ETO were as a bomber and anti-tank platform. A few enterprising officers used their L-4s as bombers, dropping grenades and mortar rounds on German positions. Although these missions were not officially recognized, it reflects the tenacity of the observation pilots. Prior to the war Colonel C.L.

Adams proposed a number of missions that would be well suited for the organic light plane. One of which was as an armed anti-tank platform. His contemporaries in the field artillery thought these ideas along with many of his others unrealistic. Major Charles Carpenter of the 4th Armored Division had had the same thought and devised an interesting armament arrangement for this purpose. He armed his L-4H, *Rosie the Rocketeer*, with six 2.36-inch bazookas. This armament arrangement worked as Major Carpenter was credited with destroying five tanks. He also attacked entrenched enemy with his L-4. The idea was endorsed by the leadership of the 4th Armored Division and assisted them in the breakout at Saint Lo.⁶¹ Several interesting proposals were made to employ the L-4 as an assault platform. General Patton proposed the use of eighty L-4s to ferry an infantry battalion across the Rhine to assist in establishing a bridgehead. He computed it would take three hours to conduct the shuttle flights to move a rifle battalion. This operation was not undertaken, but demonstrates the respect the senior leadership in the ETO had for organic aviation.

The conditions faced by the air sections operating in Europe were no different than those faced in other theaters. The enemy still remained the most significant threat to the air sections. Air defense artillery, enemy fighters and ground fire continued to take their toll of L-4s. But the impact of organic aviation was of such importance to the AGF that they openly pursued the expansion of this capability into other branches. The previous AGF position had been to restrict the use of light planes to the field artillery. This was done to prevent the loss of this capability to the AAF. However, as the AAF never produced sufficient liaison squadrons to support the AGF requirements, the AGF no longer felt that the continued expansion of this capability would provoke the AAF.⁶²

China-Burma-India Theater of Operations

The AGF did not provide any air sections to this theater as there were no artillery battalions assigned to the CBI. The AAF was the primary operator of light planes in the CBI. Liaison squadrons filled a unique niche that troop carrier squadrons could not provide in this austere and rugged environment. The jungles of Burma and China saw the most aggressive use of these airplanes by the AAF. The unique TTPs developed out of necessity would become SOP for use by both the AAF and the AGF.

The light planes of the 71st Liaison Squadron proved invaluable to this theater. The first liaison squadron introduced to combat, they provided support to all Allied forces in the theater. The light planes of the 71st were used extensively in building both the Ledo Road and Burma Road. Engineers, surveyors and commanders alighted in these small planes to map and plan the route that would provide a 1,445-mile overland supply route to China and introduce sufficient combat forces to defeat the Japanese in the jungles of Burma.⁶³ This saved valuable time in the construction of the road network and proved more effective than the arduous task of overland survey.

The liaison squadrons also supported the major undertaking of resupplying units in the field. The C-47s would fly the "Hump" bringing precious supplies of all classes of supply to the theater area of operations. Often times these much needed supplies were filled into the back of liaison airplanes at maximum gross weight where they dispersed them to remote interior jungle outposts. The Hump was no stranger to the light planes of the liaison squadron either, many pilots flying this treacherous mountain route at the lower altitudes where violent air currents could smash a light plane into the ground before the pilot was aware of what was happening.

The most important mission flown by these organizations was casualty evacuation. Thousands of Allied soldiers died of wounds in this theater until the arrival of light planes. The terrain and distances negated overland ground evacuation. A number of methods were used to evacuate the wounded by air. These included troop transports, gliders, light planes and later helicopters. Of these platforms available, the light plane was the most reliable. Airfields were built adjacent to the field hospital with taxiways running up to the receiving and evacuation wards to eliminate transloading of patients to ambulances. In this manner light planes could make dozens of shuttle runs from the forward jungle strips to the rear area⁶⁴

The 1st and 2d Air Commandos flew some of the most dangerous and spectacular missions in the theater.⁶⁵ Flying at the spearhead of "Merrill's Marauders" or the British, the first task accomplished was the clearing of an airfield to maintain critical command and control links to the rear. Their operations paved the way for the present day Air Commandos of the USAF Special Operations Command.

Lesser known of the AGF use of light planes were those to support the Office of Strategic Services Detachment 101. Detachment 101 was organized to conduct a variety of missions behind Japanese lines to include espionage, sabotage, guerilla warfare, and escape and evasion. Critical to the success of Detachment 101 was dedicated air support. Initially using British *Gypsy Moth* and a Stinson 105, the detachment received authorization to increase its flight detachment to include several L-1s that were sent from the States. General Stilwell authorized an additional increase in the size of the flight section to support operations in the Myitkyina area. The detachment grew in strength to include eleven L-4s and L-5s, five L-1s, and one C-64. The pilots, with the exception of

one civilian, were all Army sergeants. The flight section performed the same missions as those of the AAF liaison squadrons with the distinction that they flew in direct support of guerrilla warfare conducted by Detachment 101. Later the 10th Air Force attached the flight section five P-38s for close air support. The flight section's light planes began performing "Horsefly" operations to support the inclusion of these fighter-bombers.⁶⁶

South West Pacific and South Pacific Theater of Operations

The use of air sections in the Pacific, although faced with a number of complex challenges, was as important as their predominate use in the European Theater. All services used the light plane to great extent where possible and when available. Challenges that faced the employment of light aviation in the Pacific included the environment, terrain and availability of aircraft. Despite these challenges, all the services used light planes to great utility in this complex theater.

The artillery L-4s of the Pacific earned the respect of both Allies and Japanese alike. Because the terrain compromised the ability of ground observers to acquire and adjust artillery fire with any great success, air sections were the primary means to service targets with effective fires. The first use of artillery air sections was during fighting on New Guinea. Air sections were the first to utilize the recently captured Salamaua airstrip in September 1943. In a press release by the Army to war correspondents the briefing officer told them that they were flying Cubs from the airstrip much to the shock of the attending correspondents. This statement alone convinced the reporters that the action on New Guinea was going well for how else would they be able to operate these unarmed little airplanes so far forward. The press would soon begin to realize what the

contribution of these air sections was to the success of General MacArthur's Pacific strategy.

The artillery air sections quickly gained valuable experience in early fighting on New Guinea. The dense jungle often placed the front line of troops twenty-five yards from the enemy and denying terrestrial observation. Artillery was virtually blind in these conditions and mistakes in target location could cause grievous errors amongst the Allies in these close quarters. Air sections could easily identify terrain from a perch above the jungle and adjust accurate fires onto Japanese positions. To overcome many of the challenges faced in the jungle environment air sections developed procedures to aid both pilots and ground forces in target identification. The first of these was the use of flamethrowers to define the front line trace. Smoke was also good in identification of friendly positions. Just as the Germans had learned to avoid the small airplanes, so too had the Japanese. Seldom were L-4s fired upon for fear of reprisal by Allied artillery. Interrogation of Japanese prisoners and radio intercepts placed great credibility on the light planes. The Japanese disseminated the capabilities of the L-4 as being a three place light bomber with a speed of 200 miles per hour.⁶⁷

Air sections would participate in the majority of Army operations in the "Island Hopping Campaign." During operations against Saipan and Tinian, L-4s were again put aboard carriers for the assault with the remaining L-4s of the air section following them ashore in landing craft. Shortly after the landings commenced it was necessary to launch the carrier borne L-4s to assist in observation. The only concern was that no landing site had yet been secured and it was not known if the L-4s would be able to return to the carrier for recovery. The L-4s quickly arrived on station and began adjusting both

artillery and Naval gunfire with great effect. They soon had a secure field and the remaining aircraft and personnel followed them ashore. Of all the observed fire during this operation air sections conducted eighty-five percent of these missions.⁶⁸

L-4s would participate in the invasion of the Philippines and subsequent operations to liberate the island. Air sections in the 33rd Infantry Division, well experienced from previous operations in New Guinea, were put to work supporting ground operations in the rugged area of Northern Luzon. The 33rd Division's air sections completed a host of missions. The most significant mission involved organizing a photographic team to assist in aerial topography. These air photographs were used to support operations where much of the terrain was not mapped or surveyed. The air sections also found themselves performing pathfinder missions to lead C-47s to drop zones. The air sections were quit adept at this task, knowing the small drop zones, valleys, and air patterns they led many resupply flights with great precision to the intended drop zone keeping the 123rd Infantry resupplied.⁶⁹

AAF liaison squadrons also participated in the Pacific, but not to the extent they were operating in China and Burma. Operating in New Guinea, the AAF 25th Liaison Squadron better known as the *Guinea Short Line* performed a variety of support tasks. The most significant of these was search and rescue. Flying low over the jungle the L-5s would search the inhospitable terrain looking for downed aircrews. Once located, supplies and instructions would be dropped directing them to nearest field for extraction or instructing them to move to a rendezvous point to link-up with a friendly patrol.⁷⁰

The most incredible adaptation of the light plane in the Pacific came by way of the Brodie Device. As earlier stated the challenge of air sections supporting amphibious

warfare was the availability of suitable landing areas. As the use of carriers to support light planes was the rare anomaly, most aircraft went ashore too late to assist in the decisive landing phase. The Brodie Device enabled an L-4 or L-5 to take off and land from an LST by means of a wire suspension system. The LSTs used in Europe only enabled the light planes to be launched, as there was no method of recovery on the jury-rigged flight deck. Understanding this problem, an innovative artillery officer, Lieutenant James Brodie, who was not even a pilot, designed a means by which light planes could be launched and recovered from LSTs.⁷¹ Brodie's design utilized cables suspended from two yard arms fastened to one side of the ship. The L-4 or L-5 equipped would be suspended from a trolley. The pilot would release the trolley brake and once reaching rotational speed he would disengage from the trolley. For landing the pilot would catch the wire with a specially fabricated hook device mounted above the fuselage.

After a round of successful test using a merchant ship off the Louisiana coast the Navy declined accepting the device aboard ships thinking it was for antisubmarine warfare. Brodie received a second review of the cable launching system by the biggest proponent of artillery aviation at the time General Leslie McNair. The Navy authorized the installation of the Brodie gear aboard LST 776 appropriately named *USS Brodie*.⁷² LST 776 took part in the invasion of Okinawa, Iwo Jima, Ie Shima, and Guam. She successfully launched 3,000 sorties from the wire-short takeoff and landing device. Brodie Cubs effectively adjusted rounds from Kerama Rhetto islands against Japanese on Okinawa. As there were no suitable landing areas to support the artillery battalion firing from Keramas islands, the Brodie Cubs were indispensable. Most remembered of the exploits of LST 776 was the delivery of war correspondent Ernie Pyle to Ie Shima by

way of a Brodie launched L-4. Ernie Pyle was killed shortly after his arrival by a Japanese sniper.⁷³ The Brodie device enabled the air sections to support the ground commander without the need of securing an airfield and greatly extended the capability of the light plane in the Pacific.

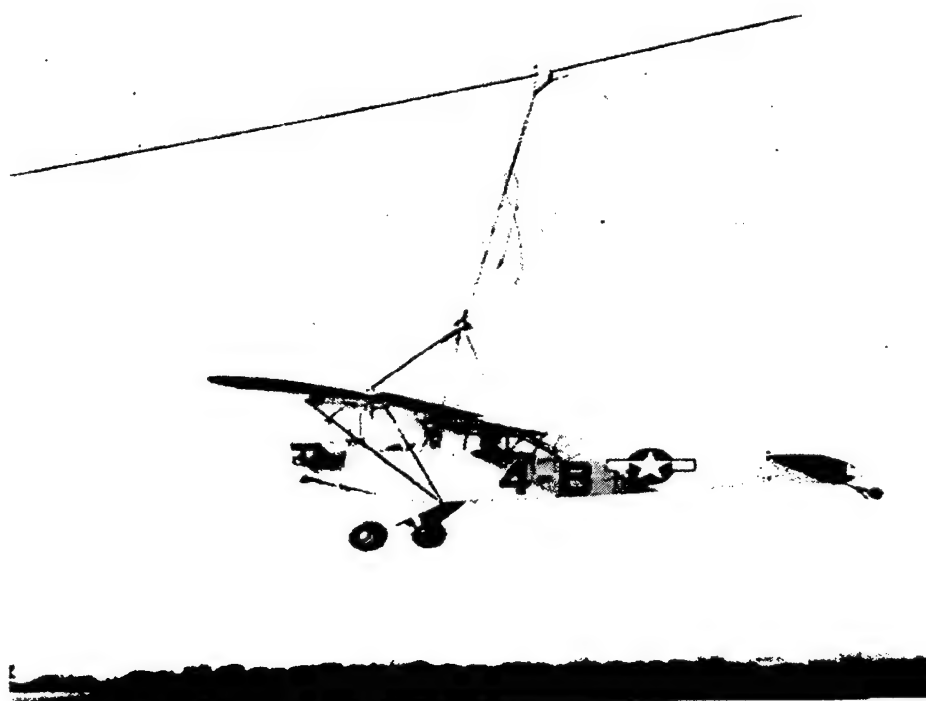


Fig. 10. L-4 utilizing Brodie Device. Source: Bill Herman, "The Army's W-STOL," *US Army Aviation Digest* (June 1969): 33.

The AGF and the AAF employed light planes into similar environments and mission profiles often complementing one another. The problems and rivalry between the AGF and the AAF senior leadership on this subject did not follow the units into combat. The chain of command in each respective theater applied all the aviation resources to the task at hand and was able to cross service boundaries without difficulty

in completing their assigned missions. The combat experience and TTPs would eventually be incorporated into the training bases in the United States and these valuable lessons were written into the training syllabus. Both the versatility of the airplanes and the ingenuity of the pilots and enlisted ground crews made these air sections indispensable to the artillery battalions. The plethora of tasks performed and envisioned by imaginative commanders and aircrews underscored the need for organic aviation in the AGF.

¹Andrew Ten Eyck, *Jeeps in the Sky: The Story of the Light Plane* (New York, Commonwealth Books, 1946), 43.

²Howard K. Butler, *Organic Aviation in the Ground Arms, 1941-1947* (Washington, DC: Government Printing Office, 1992), 57.

³Kent R. Greenfield, *Army Ground Forces and the Air Ground Battle Team Including Organic Light Aviation*, Study No. 35 (Washington, DC: Government Printing Office, 1948), 110.

⁴Hughes Rudd, "When I Landed The War Was Over," *American Heritage*, November 1981, 48.

⁵Harold H. Strickland, "Wing Talk," ed. Frederick R. Neely, *Colliers*, 17 February 1945, 8, 71.

⁶Headquarters, Army Ground Forces, 13 February 1945, subject: Report of Observer's in the European Theater of Operations, by Ground Forces Observer's, encl 13, Interviews on Field Artillery Organic Aviation, 3.

⁷*Ibid.*

⁸Alfred W. "Dutch" Shultz, interview by author, notes, St. Joseph, Missouri., 8 April 2000.

⁹Headquarters, Army Ground Forces, 13 February 1945, subject: Report of Observer's in the European Theater of Operations, by Ground Forces Observers, encl 13, Interviews on Field Artillery Organic Aviation, 3.

¹⁰HQ, AGF, 13 FEB 45, subject: Report of Ground Observers, 13.

¹¹Cornelius Ryan, *The Last Battle: The Classic Story of the Battle for Berlin* (New York: Simon and Schuster, 1995), 54.

¹²Greenfield, *Army Ground Forces*, 93.

¹³Allan R. Millet, "Nicaragua: end of an Era, 1926-1933," *The Evolution of Modern Warfare* (Fort Leavenworth, KS: US Army Command and General Staff College, 1999), 21.

¹⁴Devon Francis, *Mr. Piper and His Cubs* (Eagan, MN: Flying Books International, 1996), 93-94.

¹⁵Ten Eyck, *Jeeps in the Sky*, 49-50.

¹⁶Harrison T. Beardsley "Harrowing Crash in New Guinea," *Aviation History*, November 1999, 51.

¹⁷Howard K. Butler, *Organic Aviation in the Ground Arms, 1941-1947* (Washington, DC: Government Printing Office, 1992), 54.

¹⁸Greenfield, *Army Ground Forces*, 80.

¹⁹*Ibid.*, 81.

²⁰Herbert L. LePore, "Army Aviation in the North African Campaign," *Military Review* 72 (November 1992): 80-83.

²¹Francis, *Mr. Piper and His Cubs*, 99.

²²Herbert L. Lepore, "Eyes in the Sky: A History of Liaison Aircraft and Their Use in World War II," *Army History* 17 (1990-1991): 30-39.

²³Alfred W. Shultz and Kirk Neff, *Janey; A Little Plane in a Big War* (Middletown, Connecticut: Southfarm Press, 1998), 25-30.

²⁴*Ibid.*, 18-25

²⁵Ken G. Wakefield, *The Fighting Grasshoppers: US Liaison Aircraft Operations in Europe 1942-1945* (London: Specialty Press, 1990), 31.

²⁶Edward A. Raymond, "Air OPs," *Field Artillery Journal* 34 (May 1944): 274-275.

²⁷Francis, *Mr. Piper and His Cubs*, 100.

²⁸John E. Coleman, "Air OPs in the Tunisia Campaign," *Field Artillery Journal* 33 (September 1943): 652.

²⁹Greenfield, *Army Ground Forces*, 60.

³⁰Herbert L. Lepore, "Eyes in the Sky, 34.

³¹Greenfield, *Army Ground Forces*, 60.

³²Richard K. Tierney, *The Army Aviation Story*, ed. Fred Montgomery (Northport, Alabama: Colonial Press, 1963), 129.

³³Raymond, "Air OPs," 275.

³⁴*Ibid.*

³⁵Shultz, *Janey*, 44-48.

³⁶Francis, *Mr. Piper and His Cubs*, 105.

³⁷Tierney, *The Army Aviation Story*, 134-135.

³⁸Strickland, "Wing Talk, 71.

³⁹Raymond, "Air OPs," 277.

⁴⁰*Ibid.*, 276.

⁴¹Ten Eyck, *Jeeps in the Sky*, 59.

⁴²Shultz, *Janey*, 159-162.

⁴³*Ibid.*, 88.

⁴⁴Ten Eyck, *Jeeps in the Sky*, 42.

⁴⁵Francis, *Mr. Piper and His Cubs*, 106.

⁴⁶*Ibid.*

⁴⁷Greenfield, *Army Ground Forces*, 127-129.

⁴⁸Raymond, "Air OPs," 276.

⁴⁹Wakefield, *Grasshoppers*, 49-54.

⁵⁰*Ibid.*, 69.

⁵¹Butler, *Organic Aviation*, 24.

⁵²In Ken Wakefield's book *Fighting Grasshoppers*, he writes that no LST aircraft carriers were used in the Operation Overlord. There are several references to these LSTs being utilized in Section 9 of the General Board, United States Forces, European Theater.

⁵³Wakefield, *Grasshoppers*, 70-71.

⁵⁴*Ibid.*, 71.

⁵⁵*Ibid.*

⁵⁶The General Board, United States Forces, European Theater, "Liaison Aircraft with Ground Force Units," (Unpublished study, 1945),

⁵⁷Francis, *Mr. Piper and His Cubs*, 117.

⁵⁸General Board, "Liaison Aircraft with Ground Force Units,"

⁵⁹Shultz, *Janey*, 247.

⁶⁰General Board, "Liaison Aircraft with Ground Force Units," 25.

⁶¹General Board, "Liaison Aircraft with Ground Force Units," 24.

⁶²Greenfield, *Army Ground Forces*, 35.

⁶³Francis, *Mr. Piper and His Cubs*, 115.

⁶⁴Norman T. Kirk, "Air Evacuation of Wounded," *Military Review* 26 (January 1947): 30.

⁶⁵Otha C. Spencer, *Flying the Hump: Memories of an Air War* (College Station, Texas: Texas A&M University Press, 1994), 130-131.

⁶⁶William R. Peers, "Army Aviation In Burma," *US Army Aviation Digest* (June 1983): 2-7.

⁶⁷Charles W. Stratton, "Air OPs in New Guinea," *Field Artillery Journal* 34 (November 1944): 767.

⁶⁸George W. James, " Air OPs in the South Pacific," *Field Artillery Journal* 35 (February 1945): 98-99.

⁶⁹Ralph MacDonald, " Artillery Cubs in Mountain Operations: 33rd Inf Div in Northern Luzon," *Field Artillery Journal* 35 (October 1945): 614-615.

⁷⁰Beardsley, "Harrowing Crash in New Guinea," 51.

⁷¹William P Reeve, "The Brodie Device brought critical artillery spotting aircraft to the beachhead," *World War II*, September 1993, 12, 61-62.

⁷²Bill Herman, " The Army's W-STOL: W for wire guided," *US Army Aviation Digest* (June 1969): 33-35.

⁷³Francis, *Mr. Piper and His Cubs*, 115.

CHAPTER 5

EXPANSION AND CONCLUSION

Artillery liaison planes did a great job in the war just won. Some feel, and with good reason, that the exploitation of the capacities of the Air OP was the outstanding artillery development of World War II. In any event, I am profoundly convinced that the airplane can, and will facilitate immeasurably the successful accomplishment of the artillery mission.¹

General Henry H. Arnold

Despite his earlier stand on organic aviation, by the war's end General Arnold reversed his position on both the utility and the importance of this capability to support the AGF. Organic aviation had proven itself to be a significant combat multiplier not only to the artillery, but also to the other maneuver arms of the AGF. The capabilities of the air OP had become more important than most of the proponents in the field artillery had imagined. The air section and the light plane evolved over the course of the war. No longer was organic aviation considered to be a curiosity of the artillery. It had become a necessity seen by ground commanders to complete a multitude of missions that enhanced each branch of the Army from artillery to engineers. As an integral part of the AGF, organic aviation came into its own as one of the most valuable organizations employed during the war. This Army wide endorsement of organic aviation would set the tone for further expansion of this capability prior to and after the close of World War II.

The success of the air sections and the increasing demand on them to perform secondary missions by non-artillery organizations promoted a number of expansion concepts. These concepts involved increasing the number of aircraft assigned to the air sections, the procurement of a purpose-built airframe and the expansion of organic aviation to other branches.

One proposal was based on the need for greater numbers of aircraft to perform secondary missions left unfulfilled by the AAF and the need for a better airplane. Prior to 1945, the AGF leadership was reluctant to pursue a more capable airframe than the L-4 for fear that organic aviation would be disestablished and absorbed by the AAF.² The L-4 was a reliable airframe for aerial observation, but it lacked a useful load that would allow it to carry any significant weight. Weight was a problem especially when performing observation missions. The weight of the SCR radio sets consumed much of the useful load and limited the ability to carry a second observer. Although the L-5 provided a significant increase in the weight it could carry, it could not perform as well as the L-4. The AGF wanted a purpose built airplane that could perform as an observation platform as well as conduct the host of secondary tasks that had been developed. Finally in May 1944, the War Department authorized the AGF to field a better-equipped aircraft. The result was the Piper L-14, but only a few of these arrived by war's end. The interim fix was to obtain more L-5s, which the AGF used in corps and echelon above corps units.³

The second proposal for expansion was to provide an organic capability to other maneuver branches. The AAF set the conditions for this new expansion. In a declaration of long-term policy, dated 10 October 1944, the deputy commander of the AAF endorsed organic aviation. He also stated in this policy that the AAF recognized that the airplane being developed to replace the L-4 (L-14) was capable of supporting more than just artillery spotting and that the AGF should make maximum use of those capabilities. The AGF now had the AAF endorsement to expand organic aviation to other branches⁴.

The first attempt to institute this expansion program was in the request by the AGF to the War Department to include two aircraft in cavalry squadrons. The War Department rejected this request because the AGF had asked for the two aircraft to be L-5s. When this request was made there was a shortage of L-5s. Additionally, the AAF was attempting to make amends at earlier failures to provide the AGF with suitable photoreconnaissance units (PRU) for tactical reconnaissance. The War Department directed that the AAF conduct a study of tactical reconnaissance in support of the AGF in the ETO. The report filed in 1944 to the War Department came as an unexpected surprise for the AGF and laid the foundation for the expansion of this capability.

On return from the ETO the AAF observers Colonel John Bennet and Colonel Robert Williams, reported that PRUs were not adequate in providing the AGF the tactical picture they required. They also reported that enlisted AAF liaison pilots flying L-4s and L-5s to conduct tactical reconnaissance in tactical reconnaissance squadrons lacked sufficient knowledge about the requirements of the AGF to conduct their missions.⁵ The AAF began assigning liaison pilots and airplanes to the 12th Tactical Reconnaissance Squadron, XIX Tactical Air Command, 9th Air Force to support both the First and Third Armies in 1944.⁶ The liaison aircraft of the tactical reconnaissance squadrons operated under the provisions outlined in FM 31-35 dated 1943. This doctrine in performing observation in support of ground forces did not match the current conditions.

Their reports were forwarded to the AGF in April 1945. Immediately after receipt of this report the acting commander of the AGF recommended that infantry, airborne, mountain, armored and cavalry divisions be assigned five light airplanes. Initially, the Deputy Commander of the AAF, Lieutenant General Ira Eaker, objected to this proposal.

Eaker stated that the requirements to support these units could be fulfilled by liaison squadrons. The new commander of the AGF, General Jacob Devers, strongly supported the expansion proposal and received numerous endorsements from the theater commanders.⁷ General Marshall, Chief of Staff of the Army, also strongly supported this idea and suggested that the AAF cooperate wholeheartedly.⁸

With the endorsement of the Chief of Staff, General Devers met with the deputy commander of the AAF and came to an agreement for even a larger expansion program than had been previously recommended. The new recommendation would increase the numbers of liaison aircraft from five to six for each infantry, airborne and mountain division. Each armored division would receive nine airplanes and each cavalry division would receive seven airplanes. Additionally provisions were made for the assignment of additional aircraft to separate cavalry squadrons, tank battalions, engineer battalions, and tank destroyer groups.⁹ The path had been paved for the development of Army Aviation. The end of World War II arrived before these proposals could be implemented.

The conclusions of this research illustrate that the AGF did have a valid requirement for organic aviation. The requirement was based on a number of factors. The first is that the AAF routinely neglected the AGF requirements for aerial observation (artillery spotting) and the tasks that were needed by the AGF to support this mission.¹⁰ The second was that the AAF became so immersed in building the force structure necessary to support AWPD-1 that it neglected to maintain the force structure, material and doctrine to provide air-ground cooperation until combat operations illustrated this shortcoming in 1943. Finally, by 1944 the AAF realized that it could not match the

capability of organic aviation in supporting the AGF and was not in a position to train or equip liaison squadrons to conduct the tasks that organic aviation was performing.

Throughout the interwar period the AAF allowed functions of aerial observation to be shifted to the National Guard and the doctrine associated with these tasks to fall behind the ground maneuver doctrine and technological development. The AAF observation squadrons were far removed from the doctrinal changes in ground maneuver warfare. The support provided by the observation squadrons remained basically unchanged since World War I. The requirement for organic aviation stemmed from a need to have a responsive capability that could operate from an austere environment and could be incorporated into the evolving doctrine of maneuver warfare. The AAF organizational structure and the aircraft assigned to provide this capability did not match the AGF requirement for observation below corps level. The AAF would not provide the AGF with an organization that they had asked for since 1941 until 1943.

The AAF attempted to rectify the situation by reorganizing observation squadrons in 1943 to support the AGF. The change in organization to liaison squadrons was also an attempt to capture organic aviation from the AGF. The AAF sought to consolidate all aviation functions within the Army under the control of the AAF. This would enable them to better prioritize and resource AAF requirements. The AAF focused the preponderance of resources in building fifty-four groups to support AWPD-1. These groups were comprised of fighters and bombers necessary to conduct strategic daylight bombing in Europe. The AAF thought that organic aviation detracted from this focus and that they could better serve the AGF needs by consolidating this function under one command.

This plan failed in part because the reorganized liaison squadrons provided only thirty-two aircraft to a corps. A corps averaged between seventy to one hundred organic aircraft based on the composition of its divisions. In comparison, the AGF operated over 1,300 aircraft in the ETO alone where as the AAF provided only eight liaison squadrons (256 aircraft) to the AGF in the ETO with these squadrons not arriving until mid 1944.¹¹ The late introduction of these AAF liaison squadrons created a void in command and control, liaison, and courier support that were assumed by organic aviation from 1942. The air sections succeeded in performing these missions and developed the TTPs as well as the doctrine to support these tasks.

The posture of the AAF in supporting the AGF with aircraft and a command and control headquarters did not change significantly after 1941. The AAF failed to deliver sufficient numbers of liaison squadrons to the ASCs to support the AGF. Additionally, the squadrons employed could not generate the sortie requirement to perform both the primary mission of artillery spotting, as well as the host of secondary missions that evolved. Therefore the development of an organic capability within the AGF alleviated the demands on the AAF while they reorganized and developed capabilities to prosecute an air war against Germany and Japan.

The AAF realized that liaison squadrons were only capable of supporting organic AAF organizations. This is evident in that by 1945 eleven squadrons (352 aircraft) were assigned to the Air Corps to support training and defense functions in the United States despite a requirement to expand liaison functions to other maneuver arms. These squadrons, broken down into flights, performed a host of support tasks from gunnery training of bomber crews to supporting the US Forest Service in "Firefly" missions to

watch for forest fires in the Pacific Northwest as a result of the Japanese use of incendiary balloons.¹²

The missions performed by organic light aviation in support of the AGF in World War II ranged the tactical spectrum from combat to combat service support. In the ETO alone the Third Army flew a total of 22,972 hours for artillery spotting, 26,260 hours for reconnaissance and 19,034 hours for liaison type missions between 1 August 1944 and 8 May 1945.¹³ This organic aviation capability greatly enhanced the operations conducted by the AGF in every theater.

In the face of AAF neglect of mission requirements, and sometimes even bureaucratic resistance, the AGF developed an organic aviation capability that was responsive and versatile to adapt to the changing environment of combat. Organic light aviation far surpassed the initial requirements of the AGF and evolved to meet a host of secondary missions. This capability was a necessity born of the complex nature of modern maneuver warfare.

The most important contribution to organic aviation was not made by the senior leadership of the War Department or the AGF. Rather the visionaries in the artillery community and the dedicated officers and enlisted personnel of the air sections made it. These soldiers, many whom made the ultimate sacrifice, proved that there was no limit other than their imagination as to what they could do or support.

The investment made into organic aviation was inexpensive compared to the dividends it yielded. By the end of the war the AGF had created a viable organization with trained and resourced organizations operating under proven doctrinal concepts. The lesson to be shared with soldiers and leaders of today's Army is that Army aviation

continues to play an important role in supporting Army missions across the operational continuum and that the Army must invest in the resources, develop the soldiers and train to meet the challenges of the new millennium.

Just as the AGF did in 1941, the Army must always seek doctrine, organization, training, material, leader development and soldier system solution sets to maintain its edge on the battlefield. This development must also reflect our commitment as a member of the joint force team and complement our joint warfighting capability. This, however, must not preclude the Army from developing and maintaining organic capabilities to conduct unique service responsibilities to maximize combat power for the prosecution of land warfare.

¹Henry H. Arnold, "Air OP Was Very Young," *Field Artillery Journal* 36 (April 1946): 198.

²Kent R. Greenfield, *Army Ground Forces and the Air Ground Battle Team Including Organic Light Aviation*, Study No. 35 (Washington, DC: Government Printing Office, 1948), 20-21.

³Thomas M. Lang, "The Army Aviation Story, Part III, Fixed Wing Aircraft," *US Army Aviation Digest* (August 1962): 10.

⁴John W. Kitchens, "Organic Army Aviation in World War II: Part 2, 1944-1946," *US Army Aviation Digest* (July-August 1992): 19.

⁵*Ibid.*, 20.

⁶Ken G. Wakefield, *The Fighting Grasshoppers: US Liaison Aircraft Operations in Europe 1942-1945* (London: Specialty Press, 1990), 84.

⁷General Leslie McNair, Commanding General Army Ground Forces, was killed in action by friendly fire when observing bombers conducting close air support in August 1944.

⁸Kitchens, "Organic Army Aviation in World War II," 20.

⁹*Ibid.*

¹⁰Greenfield, *Army Ground Forces*, 9-20.

¹¹Wakefield, *The Fighting Grasshopper*, 145-147.

¹²August C. Kunz, interview by author, notes, Leavenworth, Kansas, 20 February 2000.

APPENDIX A

BRIEF CHRONOLOGY OF KEY EVENTS

1937

Summer Lieutenant Watson and Captain Burr of the 61st FA Brigade, TXANG begin private experiments using rented J-3 Piper Cubs

1940

Major General Danford, Chief Field Artillery, witnesses the RAF air OP demonstration

April US War Department releases FM 1-5 Employment of Aviation of the Army

US War Department releases FM 1-20 Tactics, Techniques and Procedures of Air Reconnaissance and Observation

August Piper conducts first demonstration of light airplanes for the Army

February Tom Case Piper Aircraft conducts demonstration of light aircraft for General Chaffee and his staff at Ft Knox, KY

William Piper provides the Secretary of War potential uses for light planes in the Army

1941

June Light aviation participates in the GHQ Maneuvers starting in Tennessee

Army Air Corps reorganized and re titled Army Air Forces

July AAF forms Air Support Squadrons

Light aviation participates in desert maneuvers at Fort Bliss and the name "Grasshopper" is coined by Major General Swift

November "Grasshopper Squadron" finishes participation in GHQ maneuvers with the Carolina Maneuvers

1942

January War Department conducts the Puddle-Jumper Conference to determine AGF aviation requirements

Training begins for the field artillery personnel that will participate in field trials of light aviation

February War Department places and order for 1,444 light airplanes

March Field trials with light aviation begin with the 2d Infantry Division and the 13th Field Artillery Brigade

War Department reorganizes the Army into three distinct components: AGF, AAF and ASF

April US War Department releases FM 31-35 Aviation in Support of Ground Forces

June War Department authorizes organic aviation for the Field Artillery

July Field Artillery School establishes the Department of Air Training under Lieutenant Colonel William Ford

November Organic aviation combat debut in Operation TORCH
AGF and AAF agree on pilot selection and training requirements

1943

April FM 1-5 updated to reflect the employment of organic aviation by the AGF

July US War Department releases FM 100-20 Command Employment of Air Power

1944

August US War Department releases FM 6-150 Organic Field Artillery Air Observation

1945

August AGF Authorized to expand light aviation into cavalry, armor, engineer, and tank destroyer units

APPENDIX B

LIAISON AIRPLANE GENERAL COMPARISON

<i>General:</i>	<u>Taylorcraft</u> L-2	<u>Aeronca</u> L-3	<u>Piper</u> L-4	<u>Stinson</u> L-5
Weight of Plane (lbs.)	827	727	740	1472
Useful Load	478	430	430	662
Power (h.p.)	65	65	65	185
Cruising Time (hrs)	2.5	2.5	2.5	3.0
Cruise Speed	75	75	70	105
Landing Speed	40	38	38	50
Fuel Capacity (gal)	14	14	12	36
Max Headwinds (mph)	25-30	25-30	25-30	35-40
Max Crosswind (mph)	15-20	15-20	15-20	20-25

Source: United States Army, FM 6-150, *Organic Field Artillery Air Observation*, 30 AUG 1944

APPENDIX C

WAR DEPARTMENT MEMORANDUM (WDCGT 320.02)

WDGCT 320.2 (2-5-42

June 6, 1942

MEMORANDUM FOR THE COMMANDING GENERAL,
ARMY GROUND FORCES:

Subject: Organic Air Observation for Field Artillery.

1. Reference is made to letter War Department, February 25, 1942, AG 320.2 (2-5-42) MT-C, subject: service Test of Organic Air Observation for Field Artillery, and 1st Endorsement, thereto.
2. Your recommendation that organic air observation units be include in Field Artillery organizations is approved.
3. It is desired that you take immediate steps to effect the necessary changes in organization, equipment and training entailed by this action. The following will govern:

a. *Organization:*

(1) Liaison airplanes will be authorized for Field Artillery units at the rate of 2 per light and medium Artillery Battalions, 2 per Division Artillery Headquarters and Headquarters Battery or Field Artillery Brigade Headquarters and Headquarters Battery.

(2) Personnel will be authorized at the rate of 1 pilot and 1/2 airplane mechanic for each liaison airplane authorized.

(3) The required changes in T/Os and T/BAs will be submitted as soon as practicable.

b. *Procurement and Maintenance:*

(1) The Commanding General, Army Air Forces will be responsible for the procurement and issues of airplanes, spare parts, repair materials and the necessary auxiliary flying equipment required by this program. The airplanes will be commercial low performance aircraft of the "Piper Cub" type.

(2) All maintenance, other than that requiring facilities of base shops, will be accomplished by army Ground Forces.

(3) Maintenance requiring the facilities of base shops will be a responsibility of the Commanding General Army Air Forces.

(4) It is desired that you confer with the Commanding General, Army Air Forces regarding the number of aircraft required under the 1942 Troop Basis, the anticipated delivery rate, the estimated requirements for spare parts, repair materials and auxiliary equipment, as well as the procedures and policies regarding their issue and delivery.

c. Personnel

(1) Qualifications:

Recommendations for the detailed qualifications and specifications for both commissioned and enlisted personnel will be submitted for approval. These will fall into two general categories: a pilot capable of piloting the liaison-type airplane as well as assisting in the normal maintenance; and a mechanic qualified to service the airplane and perform repairs incident to 1st and 2d echelon maintenance.

(2) Source of Personnel:

(a) Pilots: Volunteers, now under your control, who are qualified to pilot liaison-type aircraft will be utilized to the maximum as pilots. Additional pilots needed to fill requirements of the 1942 Troop Basis will be made available by the Commanding General, Army Air Forces.

(b) Mechanics: Mechanics will be procured from sources under your control.

(3) Extra Compensations and ratings:

(a) Pilots will be authorized additional compensation for frequent and regular aerial flights. A rating generally similar to that of a liaison pilot will be established for pilots.

(b) Appropriate ratings for mechanics may be Technician, Grade 3, or lower.

d. Training:

(1) The basic flight training of pilots will be a responsibility of the Commanding General, Army Air Forces. This training will be limited to that necessary to enable safe operation of low performance aircraft and qualify a student according to the standards established for liaison pilots.

(2) You are authorized to organize at Fort Sill, Oklahoma, or other stations selected by you, a course of instruction for the operational training of pilots, mechanics and observers in tactical employment of organic air observation in Field Artillery Units.

4. Changes in training literature will be prepared at the earliest practicable date.

5. A copy of the directive to the Commanding General, Army Air Forces is attached hereto. The Commanding General, Army Air Forces has been furnished a copy of this letter.

By order of the Secretary of War

I.H. EDWARDS,
Brigadier General,
Assistant Chief of Staff

Source: Richard Tierney, *The Army Aviation Story*, 23.

SOURCES CONSULTED

Published Material

Books

- Adcock, Al. *O-1 Bird Dog in Action*. Carrollton, Texas: Squadron-Signal Publishing, 1988.
- Andrews, Phillip. *Air News Yearbook*. New York: Duell, Sloan and Pearce, 1942.
- Bergerson, Frederic A. *The Army gets an Air Force*. Baltimore: John Hopkins University Press, 1980
- Block, Eugene B. *Above the Civil War: The Story of Thaddeus Lowe*. Berkley, California: Howell-North, 1966.
- Bradin, James W. *From Hot Air to Hellfire: The History of Army Attack Aviation*. Novato, California: Presidio, 1994.
- Bridgman, Leonard, comp. *Jane's All the World's Aircraft, 1943-44*. New York: Macmillan, 1945.
- Bright, Charles D. *Historical Dictionary of the U.S. Air Force*. Westport, Connecticut: Greenwood Press, 1992.
- Butler, Howard K. *Liaison Aircraft 1947-1950*. Historical Division, History Study No.3 US Army Aviation Systems Command, St. Louis, Missouri, 1987.
- _____. *Organization of Army Aviation, 1942-1953*. Historical Division, History Study No. 13 US Army Aviation Systems Command, St. Louis, Missouri, 1988.
- _____. *The Short-Range Liaison aircraft 1937-1941*. Historical Division, History Study No. 16 US Army Aviation Systems Command, St. Louis, Missouri, 1989.
- _____. *Observation Aircraft, 1935-1941*. Historical Office, US Army Aviation Systems Command, St. Louis, Missouri, 1990.
- _____. *Organic Aviation in the Ground Arms 1941-1947*. Washington, D.C.: Government Printing Office, 1992.
- Ford, William Wallace. *Wagon Soldier*. North Adams, Massachusetts: Excelsior Printing, 1980.

- Francis, Devon. *Mr. Piper and His Cubs*. Eagan, Minnesota: Flying Books International, 1996.
- Gabel, Christopher R. *The U.S. Army GHQ Maneuvers of 1941*. Washington, D.C.: Center of Military History, 1992.
- Goldberg, Alfred. *A History of the United States Air Force, 1907-1957*. Princeton: D. Van Nostrand, 1958.
- Greenfield, Kent R. *Army Ground Forces and the Air-Ground Battle Team, Including Organic Light Aviation*. Study No. 35. Carlisle Barracks, Pennsylvania: United States Army War College 1948.
- Halberstadt, Hans. *Army Aviation*. Novato, California: Presidio, 1990.
- Mason, Herbert A., R. G. Bergeron, and J. A. Renfrow Jr. *Operation Thursday: Birth of the Air Commandos*. Washington, D.C.: Government Printing Office, 1994.
- Paret, Peter. *Makers of Modern Strategy from Machiavelli to the Nuclear Age*. Princeton: Princeton University Press, 1986.
- Ryan, Cornelius. *The Last Battle*. New York: Simon and Schuster, 1995.
- Schultz, Alfred W. *Janey: A Little Plane in a Big War*. Middleton, Connecticut: Southfarm Press, 1998.
- Smith J. R., and Antony L Kay. *German Aircraft of the Second World War*. Baltimore, Maryland: Nautical & Aviation Publishing Company of America, 1972.
- Spencer, Otha C. *Flying the Hump: Memories of an Air War*. College Station, Texas: Texas A&M University Press, 1992.
- Ten Eyck, Andrew. *Jeeps in the Sky: The story of the light plane*. New York: Commonwealth, 1946.
- Tierney, Richard. *The Army Aviation Story*. Northport, Alabama: Colonial Press, 1963.
- Wakefield, Ken G. *The Fighting Grasshoppers: US Liaison Aircraft Operations in Europe, 1942-1945*. London: Specialty Press, 1990.
- Watts, Barry D. *The Foundations of US Air Doctrine: The Problem of Friction in War*. Maxwell AFB, Alabama: Air University Press, 1984.

Wesley, Frank Craven, and James Lea Cate. *The Army Air Forces in World War II*. Chicago: University of Chicago Press, 1958.

Periodicals and Articles

Adams, Charles E. "One Idea Plus \$10,000." *Field Artillery Journal* 36 (April 1946): 204-207.

Arnold, Henry H. "The Air OP Was Very Young." *Field Artillery Journal* 36 (April 1946): 198-200.

Baxter, Gordon. "Grasshoppers and Flitfires." *Flying*, October 1987, 98.

Beardsley, Harrison T. "Harrowing Crash in New Guinea." *Aviation History*, November 1999, 46-52.

Bestor, Richard J. "Artillery and the Fighter Bombers." *Field Artillery Journal* 36 (January 1946): 50-52.

Binzer, Robert D. "My Recollections of the 19th Liaison Squadron." *Liaison Spoken Here*, Winter 1999, 7.

Blackeley, H. W. "We Must See With Our Own Eyes." *Field Artillery Journal* 29 (May/June 1939): 215-218.

Borning, Bernard C. "Artillery on Offshore Islands." *Field Artillery Journal* 36 (February 1946): 90-91.

Cooling, Franklin B. "A History of U.S. Army Aviation." *Aerospace Historian*, June 1974, 102-109.

Crystal, T. L. "Fly It Away." *Field Artillery Journal* 31 (October 1941): 781.

Edmonds, James. "Notes on Artillery Air Observation." *Field Artillery Journal* 33 (December 1943): 893.

Ely, Louis B. "The Autogiro: An Observation Post." *Field Artillery Journal* 29 (May/June 1939): 202-214.

Epstein, Laurence B. "Army Organic Light Aviation: The Founding Fathers." *U.S. Army Aviation Digest* (June 1977): 2-17.

Ford, William W. "Grasshoppers." *Field Artillery Journal*, 32 (July 1942): 651.

- _____. "Forty Years of Army Aviation: Part I, Grasshoppers." *U.S. Army Aviation Digest* (June 1982): 3-10.
- Foster, Ivan L. "With The Other Arms and Services." *Field Artillery Journal* 31 (December 1941): 969-977.
- Frisbee, John L. "Jungle Rescue." *Air Force Magazine*, May 1992, 9-10.
- Glines, C. V. "Safe Aircraft Competition.," *Aviation History*, November 1999, 3838-44, 78.
- Harris, Audrey E. "Pilot Duane Francies." *World War II*, February 2000, 18, 20-24.
- Hazeltine, C. A. "Aeroplane Observation of Artillery Fire Against Ships." *Field Artillery Journal* 52 (January 1920): 55-64.
- Herman, Bill. "The Army's W-STOL." *U.S. Army Aviation Digest* (June 1969): 32-34.
- James, George W. "Air OPs in the South Pacific." *Field Artillery Journal* 35 (February 1945): 98-99.
- Johnson, Garner "Forgotten Progress: The development of close air support doctrine before World War II." *Air Power History*, spring 1999, 48-52.
- Kay, William K. "The Army Aviation Story." *US Army Aviation Digest* (June 1961): 1-6.
- Kirk, Norman T. "Air Evacuation of Wounded." *Military Review* 10 (January 1947): 27-33.
- Kitchens, John W. "Organic Army Aviation in World War II: Part 1." *US Army Aviation Digest* (May-June 1992): 10-17.
- _____. "Organic Army aviation in World War II: Part 2." *U.S. Army Aviation Digest* (July-August 1992): 14-24.
- Lang, Thomas M. "The Army Aviation Story: Part 3." *US Army Aviation Digest* (August 1962): 9-15.
- LePore, Herbert P. "Army Aviation in the North African Campaign," *Military Review* 72 (November 1992):80-83.
- _____. "Eyes in the Sky: A history of Liaison Aircraft and Their Use in World War II." *Army History* 17 (Winter 1990-1991): 30-38.

- McDonald, Ralph. "Artillery Cubs in Mountain Operations." *Field Artillery Journal* 35 (August 1945): 614-616.
- McNAir, Leslie J. "And Now the Autogiro." *Field Artillery Journal* 27 (January-February 1937): 5-17.
- Merrit, James A. "Aviation as an Aid to Artillery." *Field Artillery Journal* 4 (1914): 545-561.
- Neely, Frederick R. "Wing Talk." *Colliers*, February 1945, 8.
- Nye, W. S. "Lessons From the Maneuvers." *Field Artillery Journal* 31 December 1941): 914.
- _____. "New Autogiro Tested As Flying OP." *Field Artillery Journal* 31 (June 1941): 433.
- Palmer, W. B. "Field Artillery: 1941." *Field Artillery Journal* 31 (September 1941): 643-645.
- Peers, William R. "Army Aviation in Burma." *US Army Aviation Digest* (June 1983): 2-7.
- Raymond, Edward A. "Air Ops." *Field Artillery Journal* 34 (May 1944): 274-278.
- Reefe, Wm P. "The Brodie Device." *World War II*, September 1993, 12.
- Rosner, Erv. "An Anzio Invader recalls the days on the beach," *Liaison Spoken Here*, spring 2000, 9.
- Rudd, Hughes. "When I Landed The War Was Over." *American Heritage*, November 1981, 33-35.
- Rutledge, Angus. "Organic Air Observation for Field Artillery." *Field Artillery Journal* 32 (July 1942): 498-501.
- Spence, Charles. "They're not all Piper Cubs." *Aviation History*, November 1997, 5-8.
- Stratton, Charles W. "Air OPs in New Guinea." *Field Artillery Journal* 34 (November 1944): 767.
- Tierney, Richard K. "The Army Aviation Story: Part 1." *US Army Aviation Digest* (June 1962): 2-25.

_____. "The Army Aviation Story: Part 2." *US Army Aviation Digest* (July 1962): 10-15.

_____. "The Birth of Liaison Aviation." *Liaison Spoken Here*, spring 1992, 1-3, 6.

Truby, J. David. "Pesky Ships of the Air." *Military History*, February 1988, 8, 58-61.

Verdurand, A. "Flying Observation Posts for Artillery." *Field Artillery Journal* 29 (May/June 1939): 197-201.

White, Robert M. "Air OPs in New Guinea." *Field Artillery Journal* 34 (May 1944): 278.

Wolf, Gordon J. "Emergency Wire Laying by Liaison Airplane." *Field Artillery Journal* 34 (August 1944): 55-56.

Government Documents

US Army. FM 1-5, *Employment of Aviation of the Army*. Washington, D.C.: GPO, April 1940

US Army. FM 1-5, *Employment of Aviation of the Army*. Washington, D.C.: GPO, April 1943

US Army. FM1-20, *Tactics and Techniques of Air Reconnaissance and Observation*. Washington, D.C.: GPO, April 1940

US Army. FM 31-35, *Aviation in Support of Ground Forces*. Washington, D.C.: GPO, April 1942

US Army. FM 6-150, *Organic Field Artillery Air Observation*. Washington, D.C.: GPO, August 1944

US Army. FM 100-20, *Command and Employment of Air Power*. Washington, D.C.: GPO, July 1943

Unpublished Material

Lewis, Michael. "LTG Ned Almond, USA: A ground Commander's Conflicting View with Airmen over CAS Doctrine and Employment." Air University, School of Advanced Airpower Studies, Maxwell Air Force Base, 1997

Rogers, Neil F. "World War II Liaison Aviation in the United States Armed Forces." University of Northern Arizona, 1992.

Reports

Field Artillery School. "Digest of Conferences of Army Artillery Officers and Corps Artillery Commanders." Fort Sill, Oklahoma, 22 March 1944

The General Board, United States Forces, European Theater, Study of Field Air Observation, 1945

Interviews

Kunz, August C. AAF liaison pilot. Interview by author, 20 February 2000, Leavenworth, Kansas. Notes.

Schroepfer, John. AAF liaison pilot. Interview by author, 12 January 2000, Raytown, Missouri. Notes.

Shultz, Alfred W. "Dutch." Air Officer, 3rd Infantry Division. Interview by author, 8 April 2000, St. Joseph, Missouri. Notes.

Photographs

US Air Force Museum, Wright Patterson AFB, Ohio, Accessed from USAF Museum Air Power Archives; available from http://www.wpafb.af.mil/museum/air_power.html; Internet; accessed 17 February 2000.

INITIAL DISTRIBUTION LIST

Combined Arms Research Library
U.S. Army Command and General Staff College
250 Gibbon Ave.
Fort Leavenworth, KS 66027-2314

Defense Technical Information Center/OCA
8725 John J. Kingman rd., Suite 944
Fort Belvoir, VA 22060-6218

COL Lawyn C. Edwards
Combat Studies Institute
U.S. Army Command and General Staff College
Fort Leavenworth, KS 66027-2314

MAJ Christopher D. Wright
Center for Army Tactics
U.S. Army Command and General Staff College
Fort Leavenworth, KS 66027-2314

LTC James C. McNaughton
Defense Language Institute Foreign Language Center and Presidio of Monterey
Office of the Command Historian
1759 Lewis Road, Suite 209
Monterey, CA 93944-3222

Mr. Alfred W. "Dutch" Shultz
Country Squire Apartments
Apartment 302
1602 Buckingham Street
St. Joseph, MO 64506

Mr. Bill Stratton
Editor
International Liaison Pilot and Airplane Association
16518 Ledgestone
San Antonio, TX 78232

Mr. August C. Kunz
810 Pottawatomie Drive
Leavenworth, KS 66048

Dr. James W. Williams
US Army Aviation Center and Fort Rucker
ATTN: ATZQ-MH (Bldg 114)
Fort Rucker, Alabama 36362-5000

Dr. Boyd L. Dastrup
US Army Field Artillery Center and Fort Sill
ATTN: ATZR-M
Fort Sill, Oklahoma 73503-5001

Dr. Edgar F. Raines
US Army Center of Military History
ATTN: DAMH-HDH
Fort McNair, District of Columbia 20319-5058

LTC David Lemelin
Center for Army Tactics
U.S. Army Command and General Staff College
Fort Leavenworth, KS 66027-2314

1. Certification Date: 2 June 2000

3. Thesis Title: The Development of Organic Light Aviation in the Army Ground Forces in World War II

Signatures:

A B C D E F X
 REVERSE

6. Justification: Justification is required for any distribution other than described in Distribution Statement A. All or part of a thesis may justify distribution limitation. See limitation justification statements 1-10 on reverse, then list, below, the statement(s) that applies (apply) to your thesis and corresponding chapters/sections and pages. Follow sample format shown below:

<u>Limitation Justification Statement</u>	<u>/</u>	<u>Chapter/Section</u>	<u>/</u>	<u>Page(s)</u>
<u>Direct Military Support (10)</u>	<u>/</u>	<u>Chapter 3</u>	<u>/</u>	<u>12</u>
<u>Critical Technology (3)</u>	<u>/</u>	<u>Section 4</u>	<u>/</u>	<u>31</u>
<u>Administrative Operational Use (7)</u>	<u>/</u>	<u>Chapter 2</u>	<u>/</u>	<u>13-32</u>

<u>Limitation Justification Statement</u>	<u>Chapter/Section</u>	<u>Page(s)</u>
--	-------------------------------	-----------------------

	/		/	
	/		/	
	/		/	
	/		/	

7. MMAS Thesis Author's Signature: _____

STATEMENT A: Approved for public release; distribution is unlimited. (Documents with this statement may be made available or sold to the general public and foreign nationals).

STATEMENT B: Distribution authorized to U.S. Government agencies only (insert reason and date ON REVERSE OF THIS FORM). Currently used reasons for imposing this statement include the following:

1. Foreign Government Information. Protection of foreign information.
2. Proprietary Information. Protection of proprietary information not owned by the U.S. Government.
3. Critical Technology. Protection and control of critical technology including technical data with potential military application.
4. Test and Evaluation. Protection of test and evaluation of commercial production or military hardware.
5. Contractor Performance Evaluation. Protection of information involving contractor performance evaluation.
6. Premature Dissemination. Protection of information involving systems or hardware from premature dissemination.
7. Administrative/Operational Use. Protection of information restricted to official use or for administrative or operational purposes.
8. Software Documentation. Protection of software documentation - release only in accordance with the provisions of DoD Instruction 7930.2.
9. Specific Authority. Protection of information required by a specific authority.
10. Direct Military Support. To protect export-controlled technical data of such military significance that release for purposes other than direct support of DoD-approved activities may jeopardize a U.S. military advantage.

STATEMENT C: Distribution authorized to U.S. Government agencies and their contractors: (REASON AND DATE). Currently most used reasons are 1, 3, 7, 8, and 9 above.

STATEMENT D: Distribution authorized to DoD and U.S. DoD contractors only; (REASON AND DATE). Currently most reasons are 1, 3, 7, 8, and 9 above.

STATEMENT E: Distribution authorized to DoD only; (REASON AND DATE). Currently most used reasons are 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10.

STATEMENT F: Further dissemination only as directed by (controlling DoD office and date), or higher DoD authority. Used when the DoD originator determines that information is subject to special dissemination limitation specified by paragraph 4-505, DoD 5200.1-R.

STATEMENT X: Distribution authorized to U.S. Government agencies and private individuals of enterprises eligible to obtain export-controlled technical data in accordance with DoD Directive 5230.25; (date). Controlling DoD office is (insert).